

VARISTAR LHX 40

Original Instructions



Device number:

60714-048

60714-049

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Schroff GmbH

D-75334 Straubenhardt, Germany

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1 Safety Information

1.1 Intended Use

The 60714-048/ -049 cooling modules described in this manual are components of a Schroff VARISTAR LHX 40 cabinet. The VARISTAR LHX 40 cabinet forms a closed system and allows the cooling of electronic components mounted in its 19" plane independently of the ambient or room temperature. Before commencing operation the module must be connected to an external recirculation cooling system (reciprocator chiller).





1.2 Manufacturer's Safety Information

1.2.1 Liability Disclaimer

Schroff accepts no liability for any errors in this documentation. To the maximum extent permissible by law, any liability for damage, direct or indirect, arising from the supply or use of this documentation is excluded.

Schroff retains the right to modify this document, including the liability disclaimer, at any time without notice and accepts no liability for any consequences of such alterations.

1.2.2 Safety symbols used in this manual

	Hazardous voltage! <i>This symbol warns of hazardous voltage. Before commencing work on live sections of the equipment you should familiarise yourself with the dangers of high voltages and with the normal accident-prevention procedures.</i>
	Warning! <i>This symbol warns of danger. It indicates that you are in a situation that could be injurious to health. Before commencing work you should familiarise yourself with the normal accident-prevention procedures.</i>
	Static discharge hazard! <i>Static electricity can damage sensitive components in the system. To avoid such damage you should wear ESD armbands or maintain frequent bodily contact with a part of the metal enclosure.</i>
	Danger of tipping over! <i>The asymmetrical positioning of the cooling module poses a risk of the cabinet tipping over. The VARISTAR LHX 40 must always be adequately secured during transport.</i>

1.3 Safety Information for the Operator

Commissioning, maintenance and operation of the system may only be carried out by suitably trained technical personnel. The nationally applicable health and safety regulations must also be adhered to.

1.4 Standards and Directives

The cooling module is designed to meet the following standards and directives:

EC-Standards / Directives

- Machinery Directive 2006/42/EC
- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC
- Pressure Equipment Directive 97/23/EC
- EN 378-1, -2, -3, -4 Refrigerating systems and heat pumps
- EN 60529 Degrees of protection provided by enclosures (IP Code)
- EN ISO 12100-1, -2 Safety of machinery
- EN ISO 13857 Safety of machinery
- EN 349 Safety of machinery
- EN 60204-1 Electrical equipment of machines
- EN 61000-6-2 Electromagnetic compatibility (EMC) "Immunity"
- EN 61000-6-4 Electromagnetic compatibility (EMC) "Radiation"
- EN ISO 14121-1 Safety of machinery

National Directives

- BGR 500 Accident Prevention Regulation Refrigerating systems and heat pumps

1.5 Additional literature

You can find further information on the VARISTAR LHX 40 online at www.varistar.co.uk

2 Device description

The 60714-048/ -049 cooling modules are components of a Schroff VARISTAR LHX 40 cabinet. The module is a plug-in unit that can be fitted to the left or right in the cabinet.

- 60714-048: Cooling Module left mounting position
- 60714-049: Cooling Module right mounting position

The cooling module has a maximum cooling capacity of 40 kW and is designed for a mains supply voltage of 230 V_{AC} (115 V_{AC} and 48 V_{DC} versions are available on request).

The supply voltage is converted to 48 V_{DC} by an AC power supply to power the control electronics and the fans.

Since the control electronics and fans are designed for a 48 V_{DC} supply, the cooling module also finds application in telecommunications environments.

Further information is available on request.



ServicePLUS

For further information visit: www.schroff.biz/ServicePlus

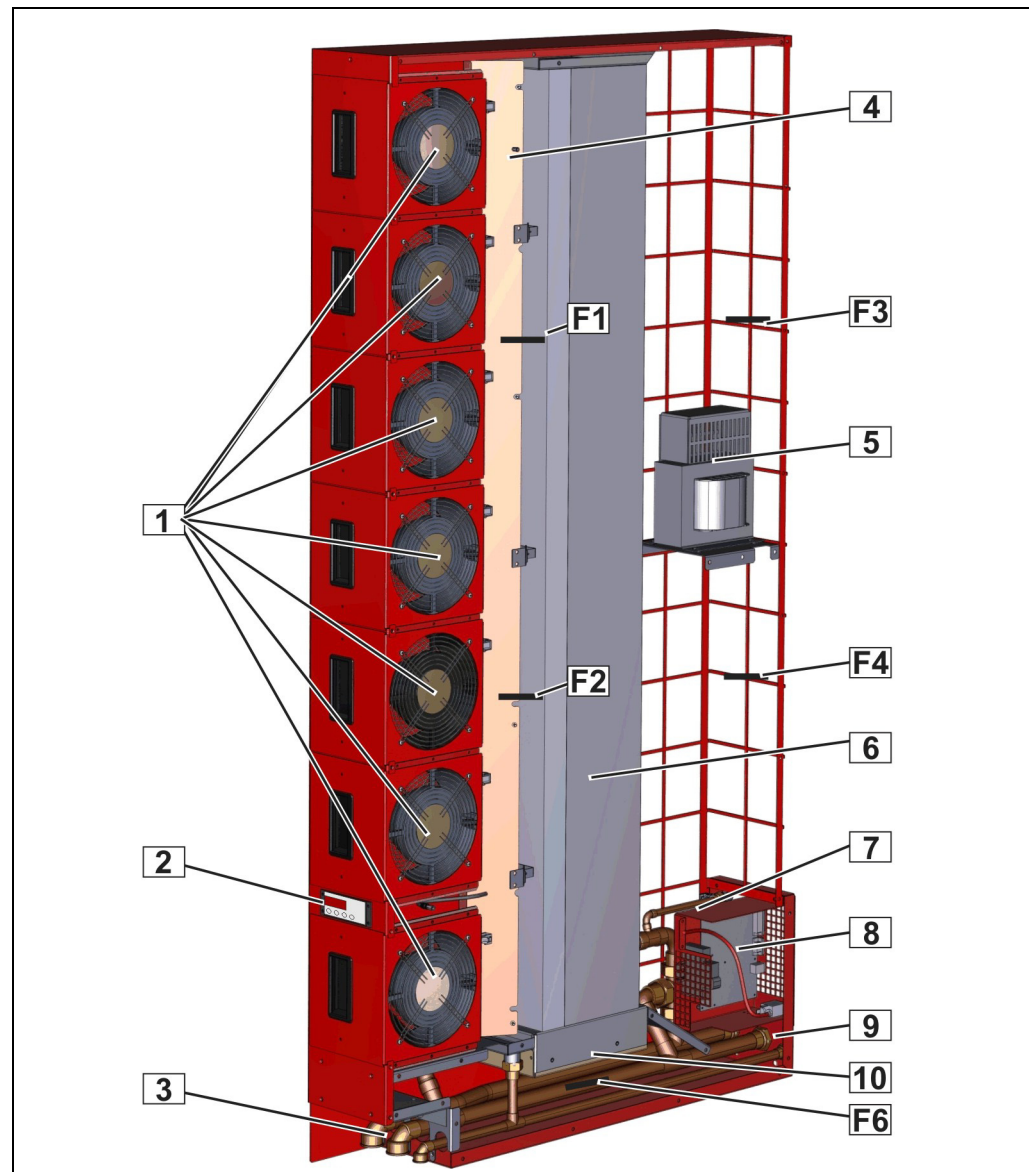


The cooling module shown in this manual is the 60714-048.

*This cooling module is finished in RAL 7021 (black grey) as standard.
It is shown in red in these instructions for greater clarity of viewing.*

2.1 Overview of Cooling Module

Overview of Cooling Module



1	Fans	8	Control Unit and Mains input IEC320-C14
2	Display and control unit	10	Rear cooling water inlet and return and condensate drain
3	Front cooling water inlet and return and condensate drain		
4	Droplet separator	F1/F2	Air outlet temperature sensors
5	AC power supply	F3/F4	Air inlet temperature sensors
6	Air/water heat exchanger	F6	Water inlet temperature sensor
7	Control valve with servo actuator/ Bleeder valve		

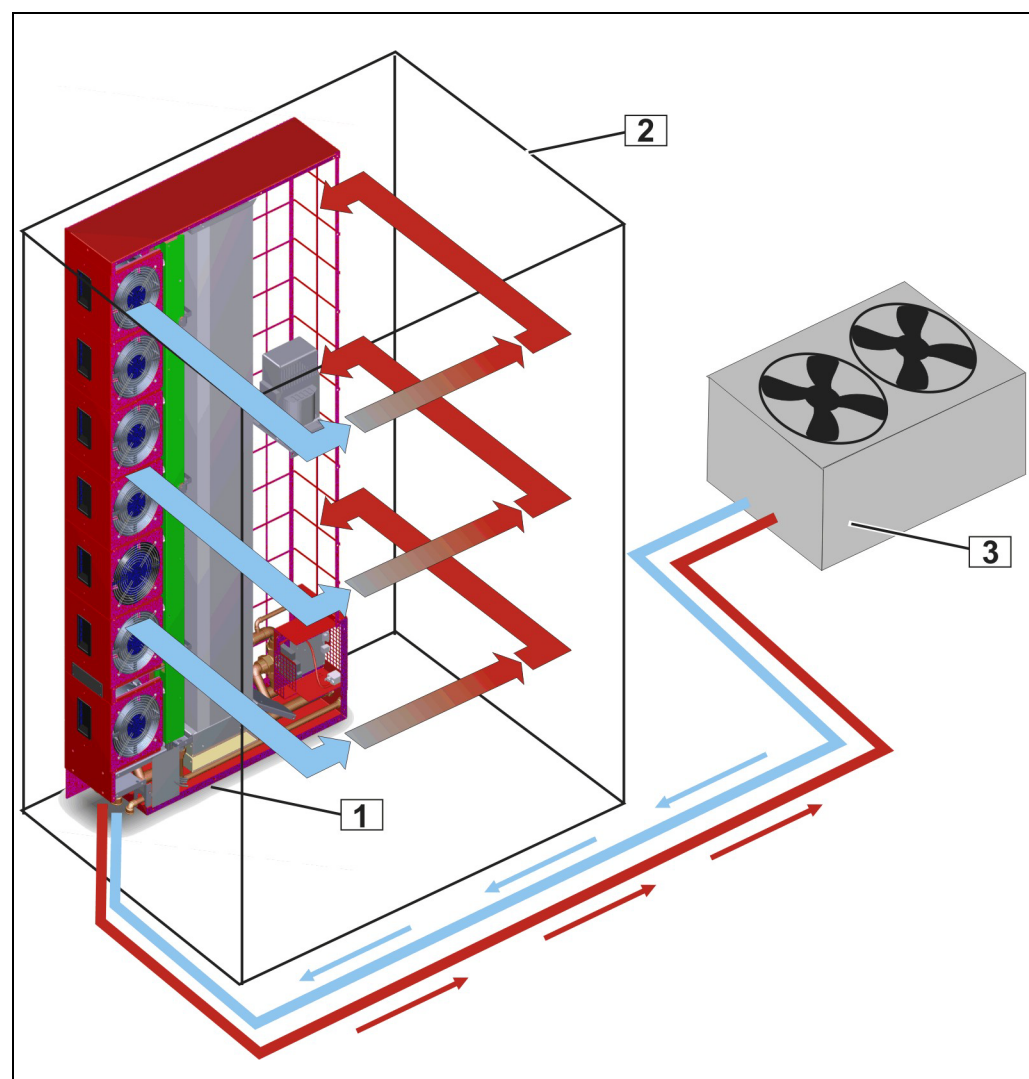
2.2 How the cooling system works

The cooling system consists of an air loop and a water loop.

The fans of the cooling unit draw warm air from the rear section of the cabinet and into an air/water heat exchanger. The air is cooled here and then blown into the front area of the cabinet.

Inside the air/water heat exchanger the heat energy of the warm air is transferred to the medium of water. The air/water heat exchanger is connected to an external reciprocal chiller unit (not supplied with the module), where the water is cooled again.

Functioning of the cooling module



- 1 Cooling module
- 2 LHX 40 cabinet

- 3 Chiller

2.3 Air loop

The heat generated by the electronic components housed in the 19" plane collects in the rear section of the cabinet. The fans of the cooling module draw the heated air away and feed it into the air/water heat exchanger. The heat energy is thus transferred to the water loop. The cooled air is then returned to the front section of the cabinet.

A droplet separator draws off any condensation that may form.

The condensation is collected in a condensation vessel and discharged via the condensate drain at the front of the LHX 40 module.

The use of 7 fans, positioned vertically over the entire cabinet height, ensures that a homogenous temperature gradation is obtained. The temperature difference may thus be reduced and the efficiency of the cooling system increased.

Air loop components:

- Air/water heat exchanger
- Droplet separator
- Fans
- Air temperature sensors

2.4 Water loop

Cooling water from the external chiller passes through the air/water heat exchanger of the cooling module, absorbs heat from this and returns to the chiller. Temperature control is obtained via a servo-driven control valve that regulates the water flow rate according to the cooling capacity required.

Please see the piping and instrumentation diagram in the Appendix for further information.

Water loop components:

- Control valve
- Air/water heat exchanger
- Water temperature sensors

Note: The control valve is in fact a three-way valve that functions as a straight-way valve since the bypass has been factory sealed. If required, the seal can be replaced by an orific $D_i = 13 \text{ mm}$ by the Schroff Service to provide three-way functionality.

2.5 Regulation

The fans and the control valve of the water loop are controlled by a microprocessor-controlled control unit.

A PID control loop regulates the water flow rate through the air/water heat exchanger on the basis of the air exit temperature from the cooling module.

To compensate for temperature gradation effects, the air exit temperature is obtained using two temperature sensors (F1/F2) set at different heights. The average of their values is used as the control value for opening and closing the control valve.

The fans are driven constantly at 80% of nominal speed to ensure sufficient air circulation in the cabinet. Should the air exit temperature exceed 26° C (factory setting), the unit switches to maximum cooling capacity: the control valve is opened to 100% and the fans are driven at 100% nominal speed.

The control characteristic has been factory preset but can be altered and adapted by Schroff Service or one of its licensed service partners.

2.6 Sensors

The control board provides interfaces/connectors for various sensors. Not all sensors are present in the factory default configuration.

Table 1: Sensoren

Name	Function	Location	Use	Application
F1	Temp. Sensor Air Exit	In front of the heat exchanger	By default	Input parameter for the control loop, Exceeding the adjustable limit triggers an alarm and activates the maximum cooling mode.
F2	Temp. Sensor Air Exit	In front of the heat exchanger	By default	
F3	Temp. Sensor Air Entry	Rear side of the cooling module	By default	Exceeding the adjustable limit triggers an alarm.
F4	Temp. Sensor Air Entry	Rear side of the cooling module	By default	
F5	Temp. Sensor Hot Spot	Custom	Option	The Hot-Spot Sensor can be mounted inside the cabinet at places with critical heat generation. Exceeding the adjustable limit activates the maximum cooling mode. The Hot-Spot Sensor can be used instead of the sensors F1/F2 as input parameter for the control loop.
F6	Temp. Sensor Water Flow	At the pipework close to control valve	By default	Exceeding the adjustable limit triggers an alarm.
F8	Sensor Humidity	Custom	Option	Exceeding the adjustable limit triggers an alarm.
F10	Sensor Leakage water	Custom	Option	Triggers an alarm.

2.7 Alarms

The control electronics can detect various faults (e.g. a broken sensor cable or a temperature that exceeds set limit values), save them in an alarm memory and signal the fault on the display or via potential-free contacts. A buzzer (horn) is fitted in the cooling module for issuing acoustic alarms.

The following situations are signalled:

- Fan speed falls below minimum permitted speed
- Fan failure
- Limit (min/max) value of a temperature sensor reached
- Broken cable on a temperature sensor
- Door open (optional)
- Max. cooling operation

3 Operating the cooling module

3.1 Control and display unit

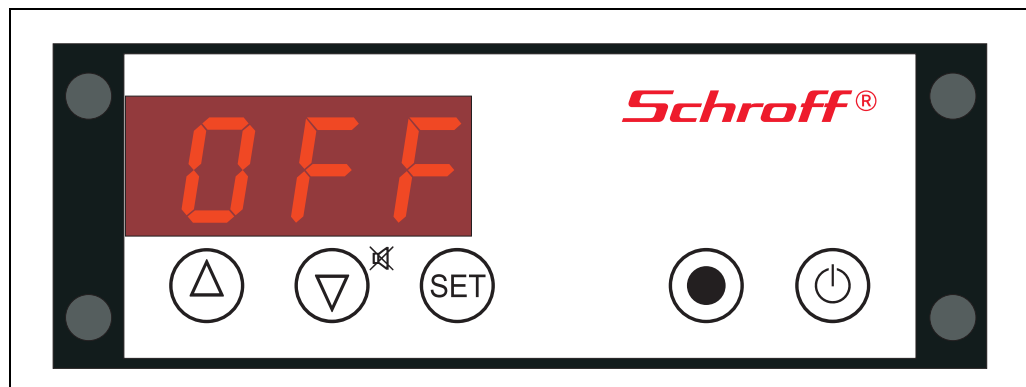
The combined control and display unit allows various settings and adjustments to be made. In normal operation the display shows the current air exit temperature from the cooling module (F1/F2 averaged).








Control and display unit

The control and display unit is located at the front side. An additional control and display unit for remote control can be connected to the RJ45 socket at the rear side of the cooling module.

Display and control unit



	UP button	Pressing this button increases the value of a parameter.
	DOWN button	Pressing this button reduces the value of a parameter. If an alarm has been activated, this button switches off the buzzer function (horn).
	SET button	Pressing the SET button during normal operation displays the current set value of the air exit temperature. Now pressing the UP button will increase the set value; pressing the DOWN button will reduce the set value.
	FUNCTION button	Pressing this button displays the air entry temperature (average values of sensors F3/F4) .
	STANDBY button	This button switches the cooling unit on or puts it into standby mode. Please note: When the unit is in standby mode, all components are still electrically live.

3.2 Setting the air exit temperature



The user can set the air exit temperature of the cooling module within the range 18° C to 30° C.

To do so, follow the following steps:

- 1 Press and hold the SET button. The current set value of the air exit temperature is displayed.
- 2 While holding down the SET button, use the UP or DOWN button to obtain the desired new set value.
- 3 Release the SET button to accept the new set value.

The user cannot make any other adjustments than the air exit temperature. Modifications to the parameterisation or control behaviour of the alarm outputs can be carried out only by Schroff service personnel or authorised Schroff service partners.

4 Storage and transport


	<p>Danger of tipping over!</p> <p><i>The asymmetrical positioning of the cooling module poses a risk of the cabinet tipping over. The VARISTAR LHX 40 must always be adequately secured during transport.</i></p>
	<p>Warning!</p> <p><i>If the unit is to be stored or transported in ambient temperatures below 0 °C, special measures must be taken to prevent frost damage.</i></p> <p><i>(See <u>Chapter 7.3.3. "Flushing the cooling module with antifreeze"</u>)</i></p>

For ease of transport the cooling module can be removed and transported separately from the cabinet. You should pay attention to the relevant work instructions and safety information.

It is essential that the VARISTAR LHX 40 and/or cooling module are free of any water during transport. (See Chapter 7.3.1. "Decommissioning the cooling module")


4.1 Removing the packaging materials


The VARISTAR LHX 40 is delivered on a special pallet. After unpacking, check the cabinet and cooling module for any damage caused during transport or otherwise.


	<p>Warning!</p> <p><i>Risk of condensation forming.</i></p> <p><i>After storage at temperatures below 10 °C, sufficient acclimatisation time must be allowed before the unit is switched on.</i></p>
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5 Commissioning


5.1 Setting up the VARISTAR cabinet

	<p>Danger of tipping over!</p> <p><i>The asymmetrical positioning of the cooling module poses a risk of the cabinet tipping over. The VARISTAR LHX 40 must always be adequately secured during transport.</i></p>
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	<p>Warning!</p> <p><i>The setting up, commissioning, completion, maintenance and repair of VARISTAR cabinets may only be carried out by suitably trained technical personnel.</i></p> <p><i>During all such operations the nationally applicable health and safety regulations must be adhered to.</i></p>
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	<p>ServicePLUS</p> <p><i>The setting up, commissioning, completion, maintenance and repair of VARISTAR cabinets may also be carried out within Schroff's service program. Please ask about our after-sales services.</i></p> <p><i>You can obtain further information about our ServicePLUS options online at: www.schroff.biz/ServicePlus</i></p>
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5.2 Initial Commissioning


	<p>Hazardous voltage!</p> <p><i>Under certain circumstances during commissioning, completion, maintenance and service it is necessary to open the enclosure.</i></p> <p><i>Some exposed parts may be under live voltage. These works must therefore only be carried out by specially trained technical personnel.</i></p>
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Before commissioning the cooling module the following work **must** be carried out:

- Connect to cooling water source.
- Connect to supply voltage.
- Bleed (exhaust any trapped air from) the cooling module.

5.3 Connect to the cooling water source

	<p>Warning!</p> <p><i>Connection to the cooling water supply may only be carried out by a refrigeration engineer or suitably trained plumber.</i></p>
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	<p>Warning!</p> <p><i>Leaking cooling water can cause damage.</i></p> <p><i>Ensure by appropriate measures (Leak sensor, automatic shut-off valves) that the damage to surrounding components in the event of a leak or defect, is avoided. These measures are dependent on the installation or the structural conditions and are the responsibility of the plumber or installation designer.</i></p>
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Notes on the water connection:

The cooling infrastructure to which the unit is connected (the external water loop) must be appropriately dimensioned by the system designer, taking into consideration the available pump pressure and type, the nominal pipe diameters and the pressure loss expected in the load circuit (the cooling module).

The water pipes used may be either flexible or rigid types. The behaviour of the materials used in the module with those of the external loop should be observed for any adverse reaction in order to avoid corrosion damage.

During construction of the external pipe circuitry care should be taken to prevent contaminants entering the system; the pipes should be flushed clean prior to connection to the cooling module.

It is recommended that isolation and drainage valves be provided for each cabinet or cooling module, together with a central water filter and air separator.

The control valve in the water loop of the cooling module is a three-way valve that is supplied configured as a straight-way (two-way) valve; the bypass is sealed closed. The advantage of this solution is that only the specific volume of water required for cooling flows through the air/water heat exchanger. The circulator pump can thus be operated with constant pressure and variable water flow.

For cooling systems in which the three-way functionality is required, the two-way valve can be suitably modified by Schroff service personnel.

5.3.1 Requirements for water quality

	<p>Warning!</p> <p><i>High risk of corrosion where aluminium is used in the external water loop.</i></p> <p><i>To prevent electrochemical corrosion the compatibility of the materials used in the cooling module with those of the external cooling circuit should be monitored and where necessary a suitable anti-corrosion agent applied.</i></p> <p><i>The type and dosage of an appropriate anti-corrosion or antifreeze depends on the structural environment and the external re-cooling system and has to be determined individual by the installation designer.</i></p>
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The following materials are used within the cooling module:

- copper
- brass
- stainless steel
- cast iron
- red brass

	<p>Warning!</p> <p><i>For problem-free operation of the cooling module, the following water quality requirements must be satisfied:</i></p> <p><i>(see also VDI 3803)</i></p>
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Table 2: Requirements for water quality

Electrical conductivity:	25 mS/m - 220 mS/m at 25 °C
Hydrogen concentration:	7.5 - 8.5 (pH value) at 20 °C
Chloride:	< 200 g/m³
Total hardness:	>3 °dH < 8 °dH
Colony-forming units:	< 10 000 CFU/ml
Appearance:	clear, without sediment
Colour:	colourless

5.3.2 Water connections at the cooling module

The water connections are situated to the front and rear of the cooling module and can be used alternatively. The pipes are fed through the base of the cabinet.



The front side water connections are compatible to the LHX 20.

Please consult the drawing provided in the Appendix of this manual for the nominal pipe diameters and position of the connections in the cabinet.

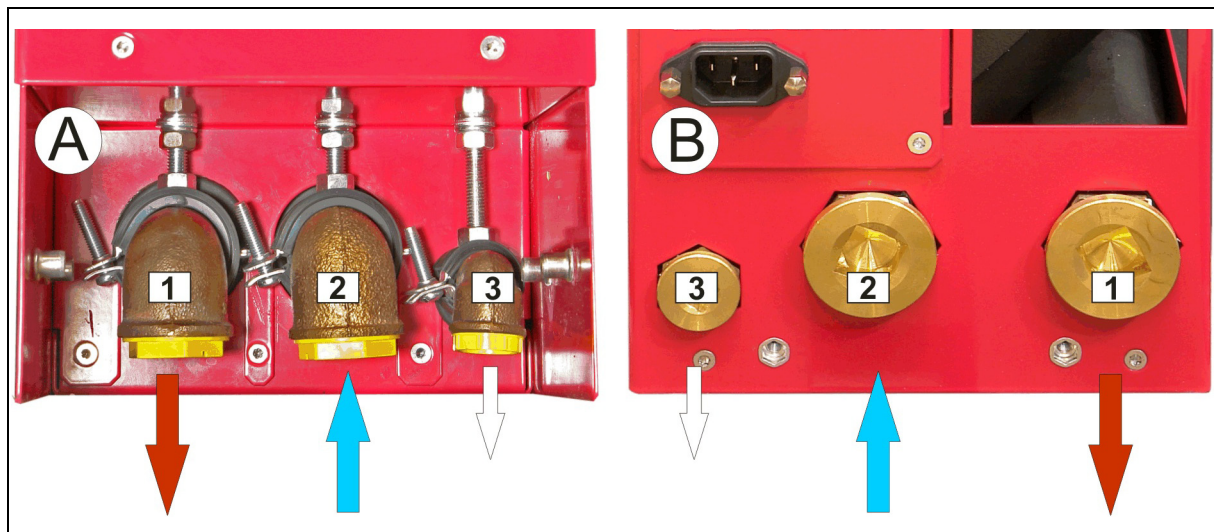
Connect the water flow (2), water return (1) and condensate drain (3) to the cooling module as shown in the illustration below.



Warning!

Ensure that the condensate drain is provided with sufficient downward gradient to the waste water system.

Water connections



- | | | | | | |
|---|-------------------|---|--------------|---|------------------|
| A | Front connections | 1 | Water return | 3 | Condensate drain |
| B | Rear connections | 2 | Water flow | | |

5.4 Connecting to the electricity supply



Hazardous voltage!

Under certain circumstances during commissioning, completion, maintenance and service it is necessary to open the enclosure.

Some exposed parts may be under live voltage. These works must therefore only be carried out by specially trained technical personnel.

Always disconnect the supply voltage before opening the module!



These cooling modules are designed for a 230 V_{AC} mains supply. The control electronics and fans, however, operate from a 48 V_{DC} supply. The 230 V_{AC} version is fitted with a 230 V_{AC} mains adaptor, which is positioned in the cooling module beneath the heat exchanger.

If the cooling unit is to be used exclusively in telecommunications environments (redundant -48 V_{DC} power supply), please contact Schroff Service for further information.

Mains supply to the 230 V_{AC} version is via a IEC320-C14 connector with cable strain relief, situated on the bottom of the cooling module.

A suitable connecting cable (IEC320-C13 Schuko) is provided with the module.

All cooling modules must be protected by an external pre-fuse of D 10 A.



Warning!

If the connecting cable supplied is not suitable for your country, you should only substitute a mains connector with protective earthing that is permitted for your device and for use in your country.



Hazardous voltage!

When power is connected, the cooling module enters standby mode. Certain parts inside the unit are however already live.

Always disconnect the supply voltage before opening the module!



When power is connected to the module the display shows "OFF". If this does not occur, open the rear drawer with the control board and check the status of the circuit breaker situated behind.

5.5 Bleeding air from the cooling system



To bleed air from the cooling system the control valve must be closed. The control valve is driven by a servo actuator and opened and closed by the control electronics according to the demand for cooling.

If the control valve is open, water from the return flow may be flow into the heat exchanger, a bleeding is not possible.

After turning off the cooling module with the ON / OFF button on the control display, the actuator drives in the "0" position and closes the control valve. If the supply voltage is disconnected before the actuator reached the "0" position, the control valve remains open. In this case, the actuator must be set by hand into the "0" position.

For safety reasons Schroff recommends that during bleeding operations the power supply be isolated and the control valve closed by operating the actuator manually.

Requirements for bleeding the system:

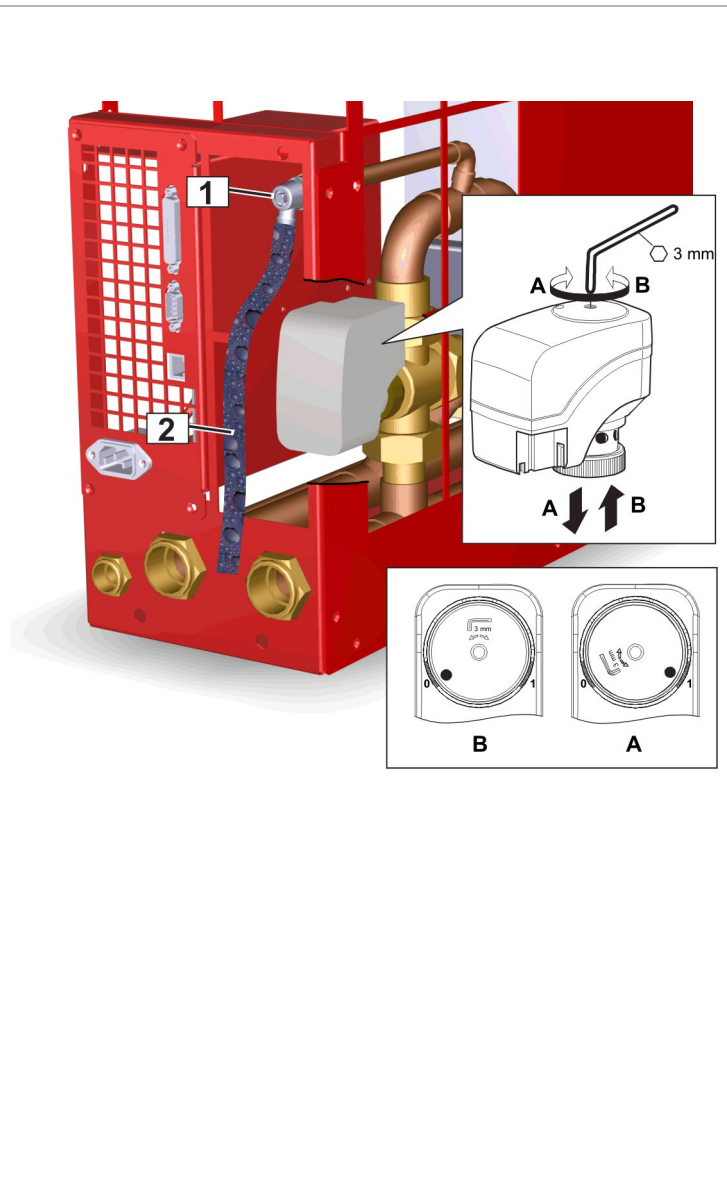
- The water installation must be fully completed. Water inlet to the module should however still be closed.
- The electrical installation must be completed.
- The refrigeration engineer or plumber with access to the water installation should be present.



If the equipment consists of multiple VARISTAR cabinets with cooling modules, all systems are bled together.

5.5.1 Steps for bleeding

- 1 Switch-off the cooling module by pushing the "OFF" button at the display.
- 2 Open the rear of the cabinet.
- 3 Ensure that the actuator is in "0" position. If not follow step (4).
- 4 Using a 3 mm hexagonal key, adjust the actuator manually to position (0).
Note: Power supply to the cooling module must be disconnected while the control valve is being operated manually.
- 5 Have the refrigeration engineer/plumber open the water flow to the cabinets. If present: open the stopcocks in the false floor in front of the cabinets.
Note: Where more than one cabinet is present, carry out steps 1 to 3 on each cabinet.
- 6 Pull bleeder tube (2) out from the module and place in a container with a capacity of at least 1.5 litres.
- 7 Open the bleeder valve (1) using the four-sided Allen key provided. Allow any air to escape. When water begins to pass, close the valve (1) again.
- 8 Repeat step 6 for all cabinets.
Note: After bleeding 3 - 4 cabinets, the plumber/engineer should allow more water to flow into the system.



5.5.2 Test operation

Connect the mains supply and switch the cooling module on with the ON/OFF button on the control unit. The fans run briefly at maximum speed before being adjusted down to nominal speed. Since there is as yet no thermal load installed in the cabinet, the desired temperature of 20 °C is quickly achieved.

Note: Where no thermal load is installed, the following situations may occur:

- (a) Error messages F16 or F18 are signalled. The water inlet temperature is too low. Remedy: Briefly switch off the cabinet on which the message appears and switch on again immediately. Messages F16 and F18 cannot be resolved in any other way.
- (b) The temperature display vacillates in the first hour between 18 °C and 25 °C. No action required; the system will stabilise by itself.
- (c) Should error messages F18 or F21 occur please notify the plumber/engineer, who should check the water inlet.

After the test run the bleeder valve (1) can be briefly opened again to check whether any air has again collected in the heat exchanger. Now the system is filled with water and bled of air. The bleeder tube can be tucked back into the module and the cover plate fitted back over the control valve. The bleeder tube must be fixed to the air inlet grille using a cable tie.



The user cannot make any other adjustments than the air exhaust temperature. Modifications to the parameterisation or control behaviour of the alarm outputs can be carried out only by Schroff service personnel or authorised Schroff service partners.

6 Interfaces

A D-Sub 25 socket, a D-Sub 9 connector and a RJ45 socket are located at the rear side. Additional interfaces are provided on the control board. (See control board overview in the Appendix.)

Interfaces



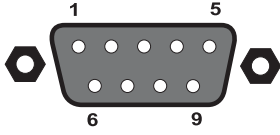
6.1 Pinout of D-Sub 25 socket

Name	Pin	Function
E12	pin 10 / pin 22	Digital input: when bridged > remote control on/off
E13	pin 11 / pin 24	Digital input: when bridged > request max. cooling output
E11	pin 13 / pin 25	Digital input: reserve
K5	pin 1 / pin 14	Relay output 1 A / 60 V, closes when power absent
K6	pin 2 / pin 15	Relay output 1 A / 60 V, closes when limit temperature value on sensors F1/F2 (outlet) is attained. Alarm threshold is set in PA0 (P10/P11).
K7	pin 3 / pin 16	Relay output 1 A / 60 V, closes when limit temperature value on sensor F5 (inlet) is reached. Alarm threshold is set in PA0 (P14/P15).
K8	pin 4 / pin 17	Relay output 1 A / 60 V, closes when limit value of fan speed is reached. Alarm threshold is set in PA0 (P21).
K9	pin 5 / pin 18	Relay output 1 A / 60 V, closes if common fault occurs

6.2 Pinout of D-sub 9 socket

RS-232 interface, interface driver galvanically isolated. Status reports are issued at this interface.

Schroff LHX Ethernet gateway can be connected here. Error codes and temperatures/speeds can be accessed via Ethernet using SNMP.

Pin	Signal	
2	RxD	
3	TxD	
5	GND	
7	RTS	
8	CTS	

6.3 RJ45 socket pinout


Two RJ45 sockets are provided on the control board. Both sockets are RS-485 interfaces, interface drivers are not galvanically isolated. One socket is located beside the D-Sub 9 socket. An external control and display unit may be connected to this (CAT 5 cable, max. cable length 100 m). The display of the cooling module is connected to the socket inside the module.


6.4 Inputs and outputs on the control board


Name	Connector/pin	Function
E9	W20: pin 1 / 2	Digital input, potential-free: connection for door contact, alarm signal (buzzer/ horn) - on after 120 s. Time is set in PA0 (P35).
E8	W20: pin 3 / 4	Digital input, potential-free: Water cooler error message (optional)
K4	W12: pin 1 / 2	Relay output (normally open) 8 (1.5) A / 250 V (water cooler enable).
K3	W11: pin 1 / 2 / 3	Relay output (changeover) 8 (1.5) A / 250 V (common fault)

An overview showing the position of the connectors on the control board is given in the Appendix.

7 Maintenance and Repair

	<p>Hazardous voltage!</p> <p><i>Under certain circumstances during commissioning, completion, maintenance and service it is necessary to open the enclosure. Some exposed parts may be under live voltage. These works must therefore only be carried out by specially trained technical personnel.</i></p> <p><i>Always disconnect the supply voltage before opening the module!</i></p>
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	<p>Warning!</p> <p><i>Commissioning, maintenance, repair and service may only be carried out by suitably trained technical personnel. The nationally applicable health and safety regulations must be adhered to.</i></p>
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	<p>ServicePLUS</p> <p><i>Where a maintenance contract has been agreed, all maintenance shall be carried out exclusively by Schroff Service.</i></p> <p><i>Please ask about our after-sales services.</i></p> <p><i>You can obtain further information about our ServicePLUS options online at: www.schroff.biz/ServicePlus</i></p>
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7.1 Inspection and Maintenance Intervals

Maintenance object	Interval	Action
Water circulation		
General	Every 2 weeks	Check quality of external cooling water
	Every 4 weeks	Visual inspection of water loop for leaks
	After opening water loop	Bleed system
Droplet separator	Every 3 - 6 weeks (dependent on site conditions and level of air pollution)	Visual inspection for contaminants; clean or replace droplet separator if required
Air loop		
Fans	Every 2 months	Check for noise etc; replace if necessary



7.2 Error messages

Message	Cause	Action at control unit	Remedy / Cause
F1	Sensor error sensor F1 (air outlet 1) (break or short circuit on sensor F1)	not required	Inspect/Replace sensor
F2	Sensor error sensor F2 (air outlet 2) (break or short circuit on sensor F2)	not required	Inspect/Replace sensor
F3	Sensor error sensor F3 (air entry 1) (break or short circuit on sensor F3)	not required	Inspect/Replace sensor
F4	Sensor error sensor F4 (air entry 2) (break or short circuit on sensor F4)	not required	Inspect/Replace sensor
F5	Sensor error sensor F6 (water entry) (break or short circuit on sensor F6)	not required	Inspect/Replace sensor
F6	Sensor error sensor F7 (water outlet) (break or short circuit on sensor F7)	not required	Inspect/Replace sensor
F7	Sensor error sensor F8 (humidity) (break or short circuit on sensor F8)	not required	Inspect/Replace sensor
F8	Motor fault M1 (fan)	Acknowledge with the DOWN button, if parameterised to hand reset.	Check motor; replace if necessary
F9	Motor fault M2 (fan)	Acknowledge with the DOWN button, if parameterised to hand reset.	Check motor; replace if necessary
F10	Motor fault M3 (fan)	Acknowledge with the DOWN button, if parameterised to hand reset.	Check motor; replace if necessary
F11	Motor fault M4 (fan)	Acknowledge with the DOWN button, if parameterised to hand reset.	Check motor; replace if necessary
F12	Motor fault M5 (fan)	Acknowledge with the DOWN button, if parameterised to hand reset.	Check motor; replace if necessary
F13	Motor fault M6 (fan)	Acknowledge with the DOWN button, if parameterised to hand reset.	Check motor; replace if necessary
F14	Motor fault M7 (fan)	Acknowledge with the DOWN button, if parameterised to hand reset.	Check motor; replace if necessary
F15	Motor fault M8 (fan)	Acknowledge with the DOWN button, if parameterised to hand reset.	Check motor; replace if necessary
F16	Air exit temperature limit value	Acknowledge with the DOWN button, if parameterised to hand reset.	Check cooling water loop, check water control valve
F17	Air entry temperature limit value	Acknowledge with the DOWN button, if parameterised to hand reset.	Check cooling water loop, check water control valve
F18	Water inlet temperature limit value	Acknowledge with the DOWN button, if parameterised to hand reset.	Check cooling water loop, check water control valve
F19	OPTION: Door open error message	Acknowledge with the DOWN button, if parameterised to hand reset.	Close cabinet door
F20	Maximum cooling error message (digital input)	Acknowledge with the DOWN button, if parameterised to hand reset.	Check cooling water loop, check water control valve
F21	Maximum cooling	Acknowledged automatically	Check cooling water loop, water control valve, droplet separator
F22	OPTION: Water leakage error message	Acknowledge with the DOWN button, if parameterised to hand reset.	Check water loop
F23	OPTION: Humidity limit value	Acknowledge with the DOWN button, if parameterised to hand reset.	Check cooling water loop, check water control valve
F24	OPTION: External water chiller error mes- sage	Acknowledge with the DOWN button, if parameterised to hand reset.	Check water chiller device
F25	OPTION: Water exit temperature limit value	Acknowledge with the DOWN button, if parameterised to hand reset.	Check cooling water loop, check water control valve
F26	Sensor error sens. F5 (Hot Spot Sensor) (break or short circuit on sensor F5)	not required	Inspect/Replace sensor
F27	Sensor error sensor 9 (diff. press extern.) (break or short circuit on sensor F9)	not required	Inspect/Replace sensor
F28	Sensor error sensor 11 (diff. press int.) (break or short circuit on sensor F11)	not required	Inspect/Replace sensor
F29	Smoke detector triggered	Acknowledge with the DOWN button, if parameterised to hand reset.	Check facility
F30	Hot Spot sensor temperature limit value	Acknowledge with the DOWN button, if parameterised to hand reset.	Check cooling water loop, check water control valve
EP	Loss of data in parameter memory	Interrupt power supply	Repair control board

7.3 Fitting/removing the cooling module

	<p>Warning!</p> <p><i>Under no circumstances should the cooling module be stored and transported in contact with water. After removal the module should be laid on its side so that any remaining cooling water can drain from the heat exchanger.</i></p> <p><i>All water connections must be closed with suitable blind plugs to prevent damage to nearby components caused by any leakage of cooling water from the unit.</i></p> <p><i>Where temperatures during storage or transport may fall below 0° C the heat exchanger should be flushed with an appropriate antifreeze (ethylene glycol).</i></p>
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7.3.1 Decommissioning the cooling module

	<p>Warning!</p> <p><i>If the water connections on the cooling module are isolated the heat exchanger remains filled with water, since the inlet and return are situated on top of the exchanger.</i></p>
	<p>Warning!</p> <p><i>Where temperatures may fall below 0° C following decommissioning the heat exchanger should be flushed with an appropriate antifreeze (ethylene glycol). Observe the safety and disposal regulations when handling with ethylene glycol.</i></p>

Work steps: decommissioning

- 1 Isolate the supply voltage
- 2 Isolate the water inlet to the cooling module
- 3 Open the bleeder valve on the cooling module
- 4 Open the drainage valve (external) and allow the pipes to drain until empty.
- 5 Disconnect water connections at the cooling module.
Note: place a suitable receptacle (approx. 6 litres) underneath.
- 6 Close the bleeder valve on the cooling module
- 7 Seal the water connections on the cooling module to prevent damage to nearby components being caused by any leakage of residual cooling water.

7.3.2 Fitting and removing the cooling module



Warning!

On account of the size and weight of the cooling module (>100 kg), do not attempt to move it unaided.

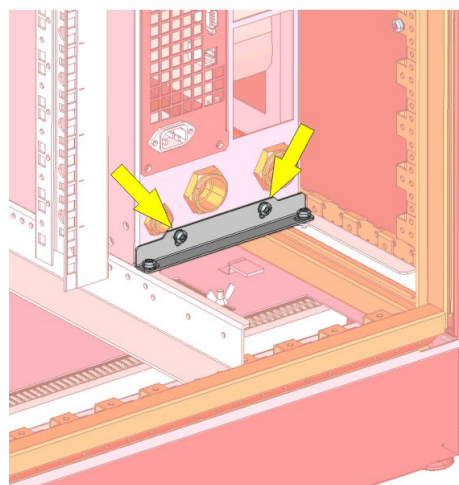
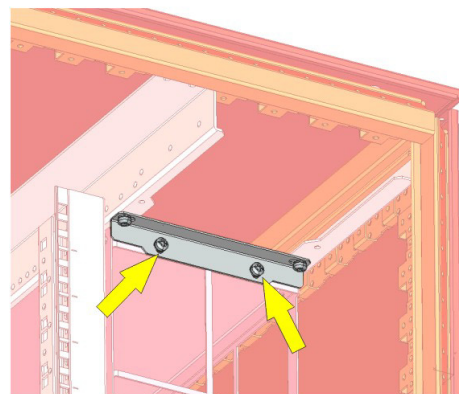
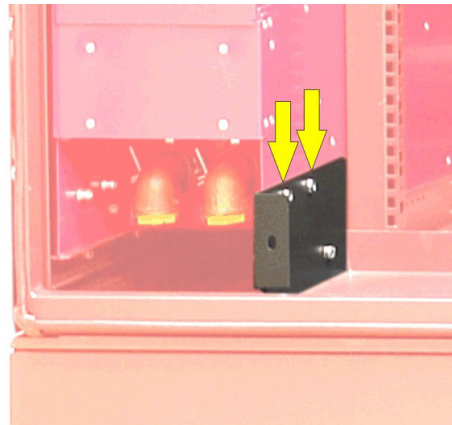
Before removing the cooling module, disconnect and seal the water to prevent damage being caused by any leakage of residual cooling water.

1 Open the rear of the cabinet and unscrew the bolts (see arrows) on the angle brackets.

2 Open the front of the cabinet and unscrew the bolts (see arrows) on the retaining plate.

3 Pull cooling unit forward to remove.
Note: The heat exchanger may still contain residual water. Ensure when removing the unit that the water connections are sealed.

4 To install the cooling module, perform the above steps in reverse.



7.3.3 Flushing the cooling module with antifreeze



Warning!

If the cooling module is to be left on its side, all water connections must first be sealed to prevent any leakage of water that could damage the control electronics.



The cooling module may be flushed with a conventional glycol-based anti-freeze, e.g. Glysantin produced by BASF.

Care should however be taken to ensure the compatibility of the antifreeze with the external pipework.



Warning!

Glycol-based antifreeze can harm your health. Observe the safety and disposal regulations when handling with ethylene glycol..

Work steps: flushing the module:

- 1 Remove cooling module from cabinet.
- 2 Close condensate drain.
- 3 Connect a pressure pump (hand pump) to the inlet.
- 4 Connect a hose (approx. 3 m) to the return.
- 5 Open the control valve actuator by hand. (See procedure in the section 'Bleeding air from the cooling module')
- 6 Lie the module on its left side (bleeder valve and condensate drain upward)
- 7 Place the inlet hose of the pump and the return hose of the cooling module in a container with capacity of approx. 15 litres.
- 8 Pour about 3.5 litres of antifreeze into the container. (This will provide frost protection down to about -20 °C)
- 9 Start the pump and allow the module to be flushed with antifreeze for between 5 and 15 minutes, until the antifreeze is fully mixed with the cooling water of the heat exchanger.
- 10 Switch off pump and open bleeder valve on the heat exchanger. (If the pump is fitted with a non-return valve, it should be replaced with a hose.)
- 11 If required, further residual water can be forced out of the heat exchanger by means of pressurised air. To do this, connect a compressor (max. pressure 6 bar!) to the inlet. Open the air pressure valve slowly to avoid an overflow of water/antifreeze mixture in the collecting vessel.
- 12 After evacuation, seal inlet and return with suitable plugs.
- 13 The module should be clearly labelled with the following text:
"Beware: contains residual coolant. Open only with a receptacle placed beneath module."
- 14 Coolant should be disposed of in accordance with environmental regulations.

7.4 Component replacement

7.4.1 Removing and fitting fans



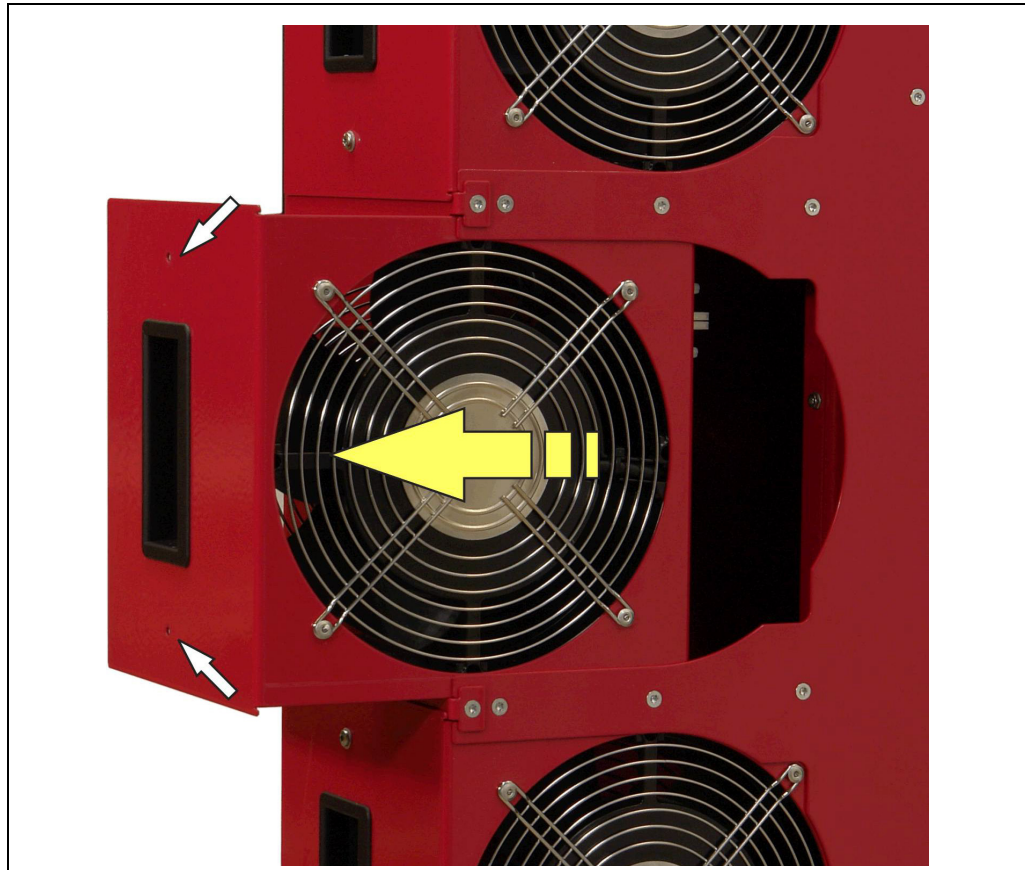
Warning!

*Fans can be replaced while the system is in operation.
Please be aware during removal, and particularly during fitting, of the mass
moment of inertia of the rotating fan.*



*If the fan still does not function after replacement, check the fan fuse on the
control board. The control board is situated at the rear side. Disconnect the
mains supply before removing the cover.*

Removing and fitting fans



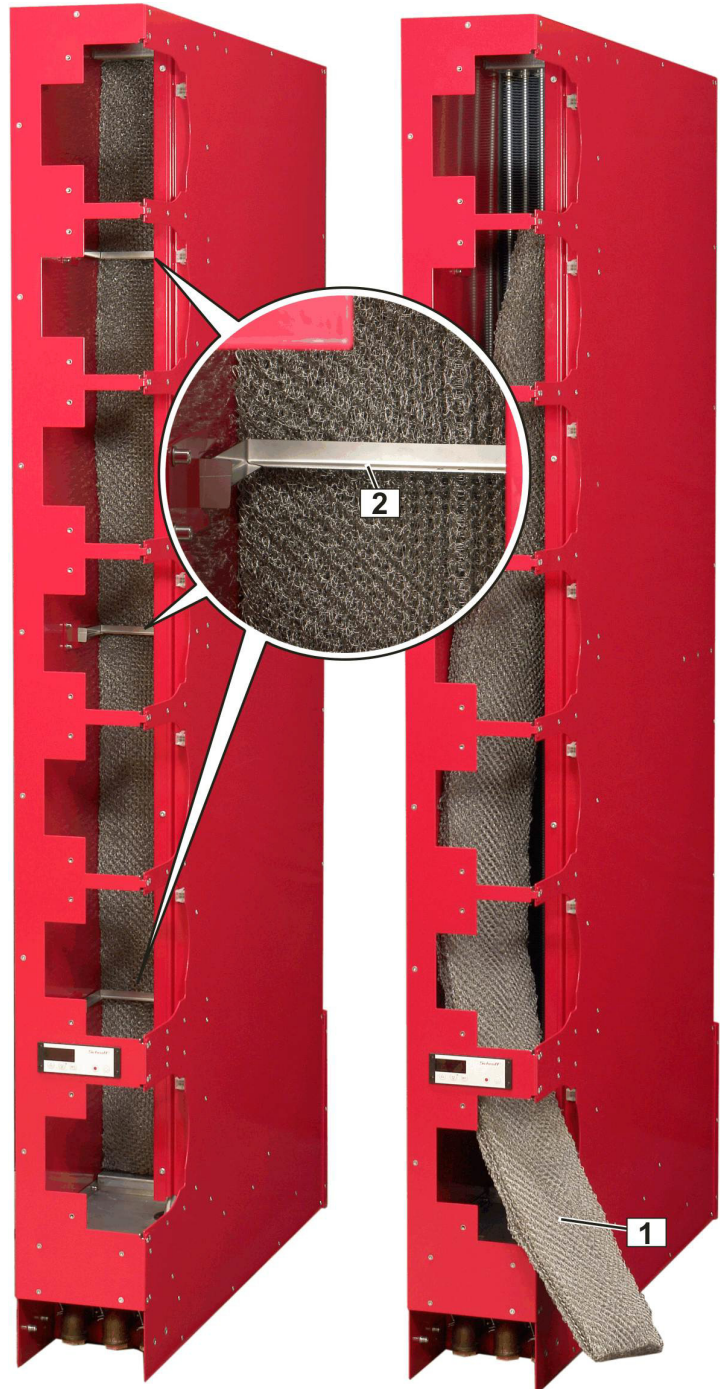
Removing and fitting fans

- 1 Unscrew nuts (see arrows).
- 2 Pull out the fan.
- 3 Fit new unit following the above steps in reverse.

7.4.2 Cleaning / replacing the droplet separator

Removing and fitting the droplet separator

- 1 Remove all fans.
- 2 Remove the fixing brackets (2).
- 3 Remove droplet separator (1) through the cutout for the lower fan unit.
- 4 Fit new unit following the above steps in reverse.



7.4.3 Replacing the electric control valve actuator



Warning!

*Before replacing the control valve actuator the cooling module **must** be isolated from the mains voltage.
Switching off with the standby button is **not** sufficient, since the actuator remains live and may be damaged during removal or fitting.*

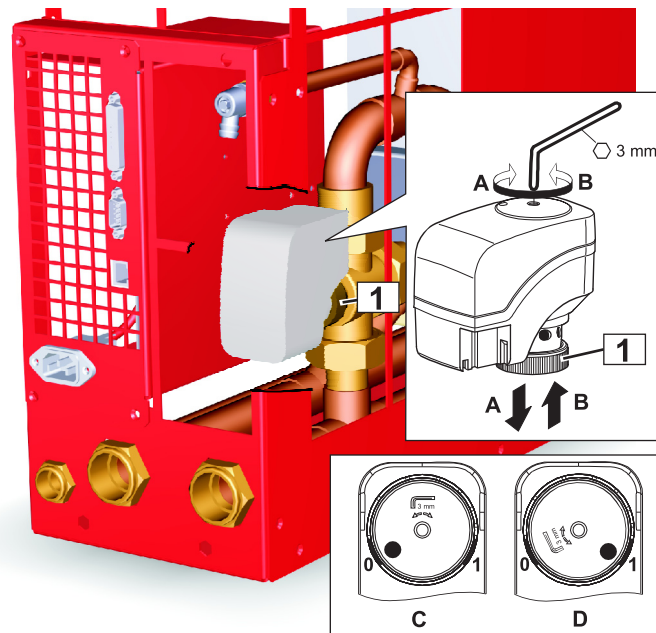


For fitting, the actuator must be in the 0 position.

*During commissioning and on every time power is applied to the actuator, the actuator performs a self-calibration routine (valve stroke 0 - valve stroke max. - valve stroke 0). No manual interventions are permitted during calibration.
If the actuator is operated without the valve, its correct functioning cannot be guaranteed.*

After three calibration attempts the valve stem remains extended. Before mounting the actuator on the control valve the power must be disconnected and the valve stem brought to the 0 position by hand. Once the actuator has been correctly fitted to the control valve and the power reconnected, the self-calibration cycle is repeated.

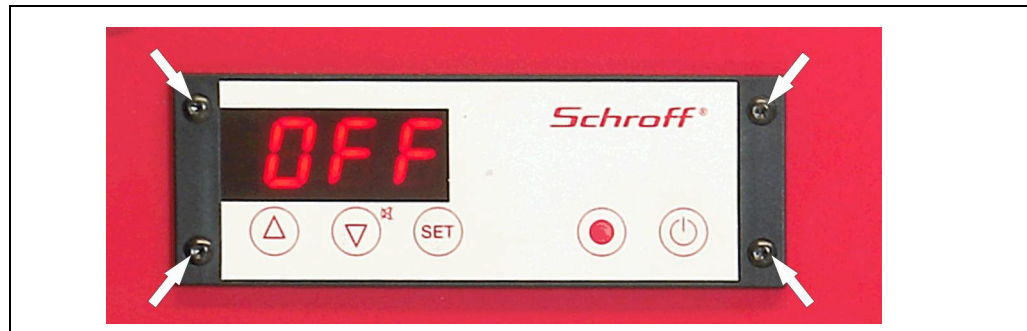
- 1 Isolate cooling module from mains supply.
 - 2 Unscrew union nut (1) on actuator and remove actuator.
 - 3 Disconnect electrical connector.
 - 4 Fit new unit following the above steps in reverse.
- Note:** Actuator must be in position "0"; see notes on the actuator.



A: Valve opens **B:** Valve closes
C: Valve closed **D:** Valve open

7.4.4 Replacing the control and display unit

Control and display unit



Removing and fitting the display unit

- 1 Unscrew bolts (see arrows) and pull the control and display unit out of the cooling module.
- 2 Disconnect RJ45 connector.
- 3 Fit new unit following the above steps in reverse.

7.4.5 Replacing the temperature sensors



Hazardous voltage!

Under certain circumstances during commissioning, completion, maintenance and service it is necessary to open the enclosure.

Some exposed parts may be under live voltage. These works must therefore only be carried out by specially trained technical personnel.

Always disconnect the supply voltage before opening the module!



The cooling module contains 5 temperature sensors.

The temperature sensors for the air exit temperature (F1/F2) are situated in front of the droplet separator.

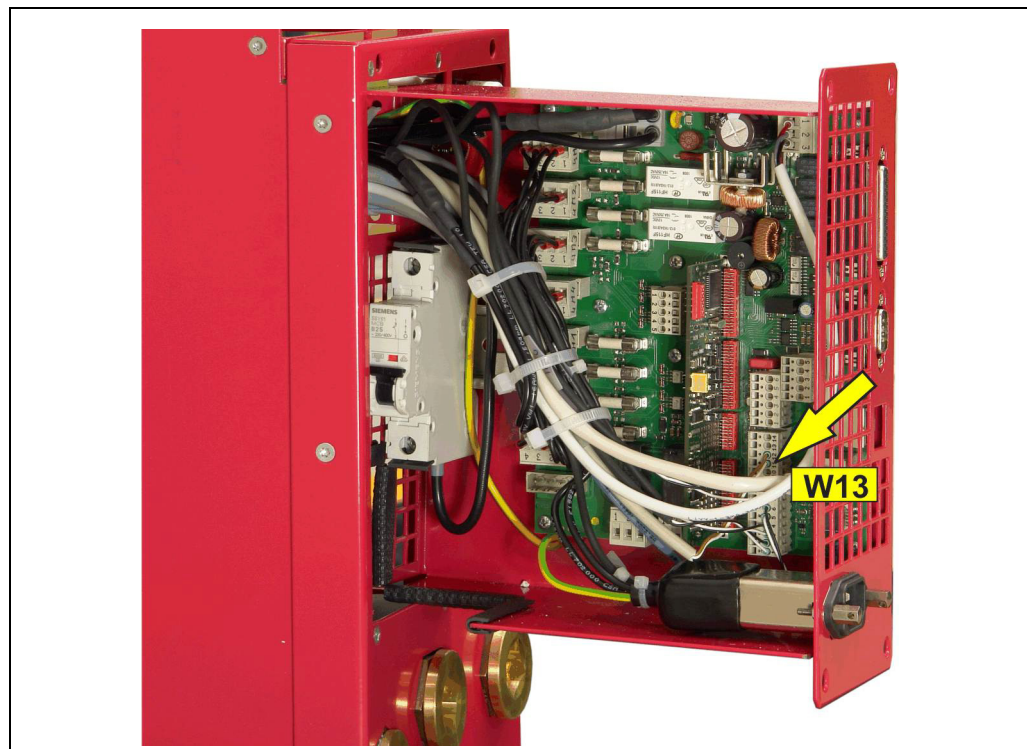
To remove these sensors the fans must be removed.

Temperature sensors for the air inlet temperature (F3/F4) are situated behind the air inlet grille and are directly accessible.

The water inlet temperature sensor is situated on the pipework near the control valve.

All temperature sensors are connected to the control board (W13 connector, see arrow).

The control board is situated on a drawer at the rear side of the cooling module.



7.4.6 Replacing other components

Provision has not been made for the replacing of other components on site. If it is not possible to bring the cooling module into operation with the steps covered in this chapter, the entire module should be removed and returned to Schroff.




ServicePLUS

Where servicing is required, contact your Schroff dealer or Schroff directly.

*You can obtain further information about our ServicePLUS options online at:
www.schroff.biz/ServicePlus*


8 Service

8.1 Service and Returns

	<p>ServicePLUS</p> <p><i>Where servicing is required, contact your Schroff dealer or Schroff directly. Where a maintenance contract has been agreed, all maintenance shall be carried out exclusively by Schroff Service. Please ask about our after-sales services.</i></p> <p><i>You can obtain further information about our ServicePLUS options online at: www.schroff.biz/ServicePlus</i></p>
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To avoid damage in transport, please return the unit only in its original packaging.

8.2 Technical support

	<p>ServicePLUS</p> <p><i>For all technical enquiries or product support or if service is required, please contact your Schroff dealer or go to www.schroff.biz.</i></p>
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8.3 Accessories

Description	Article Number
Ethernet gateway	60130-440
AC mains switch box	23207-115
External display	60714-069

8.4 Spare parts

Description	Article Number
Cooling module (left mounting position), 40 kW, 230 VAC	60714-048
Cooling module (right mounting position), 40 kW, 230 VAC	60714-049
Droplet separator	60714-074
Servo actuator for control valve	60714-054
Control board	60714-072
Control unit (display)	60714-056
Air temperature sensor incl. 3m cable	60714-057
Water temperature sensor incl. 3m cable	60714-058
Fan, complete with front panel	60714-071

9 Technical data

Table 3: Technical data

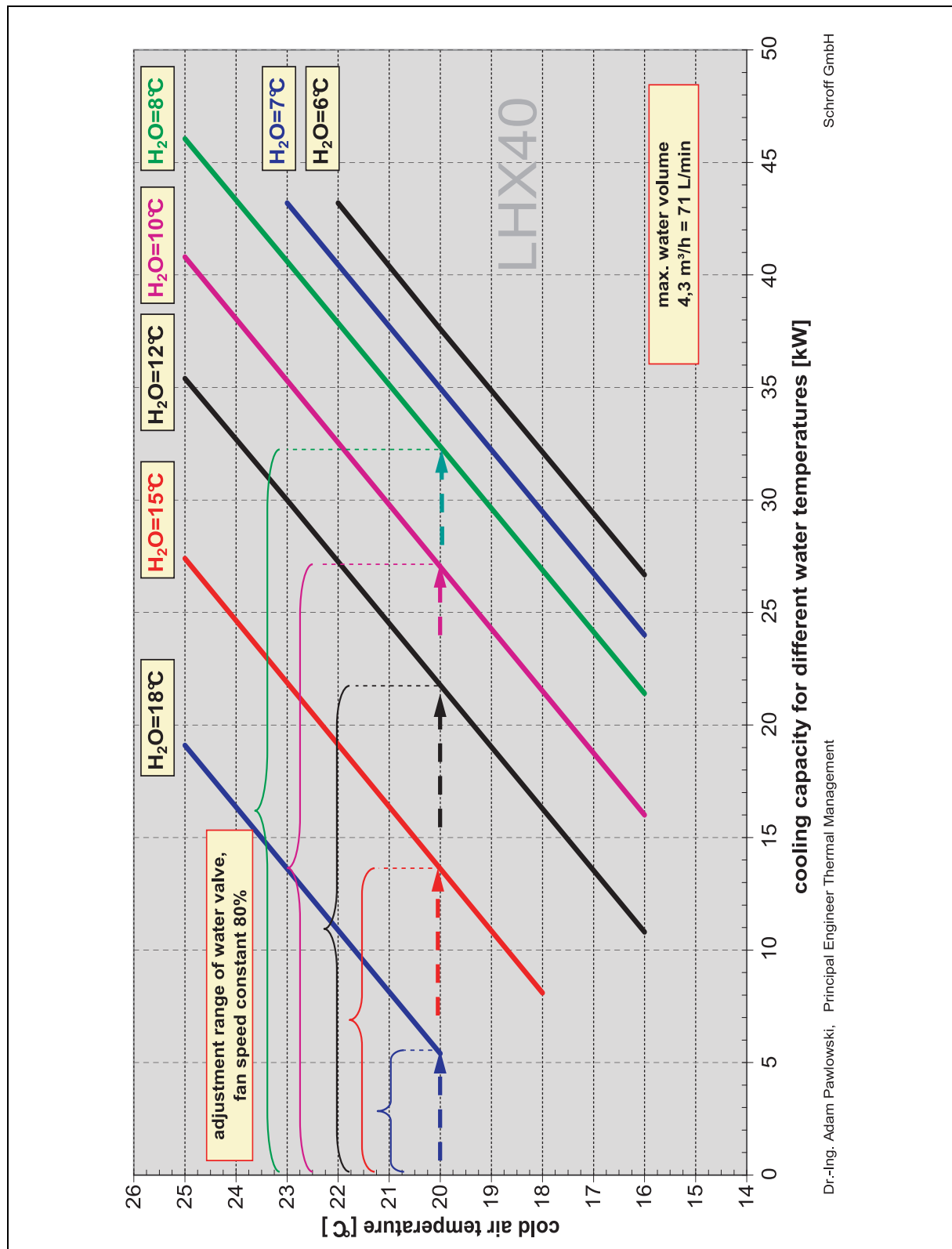
Cabinet dimensions		
Width	mm	800
Depth	mm	800-1200
Height	mm	2100/2300
Ingress protection	IP	55

Cooling module dimensions		
Width	mm	189,5
Depth	mm	955
Height	mm	1849

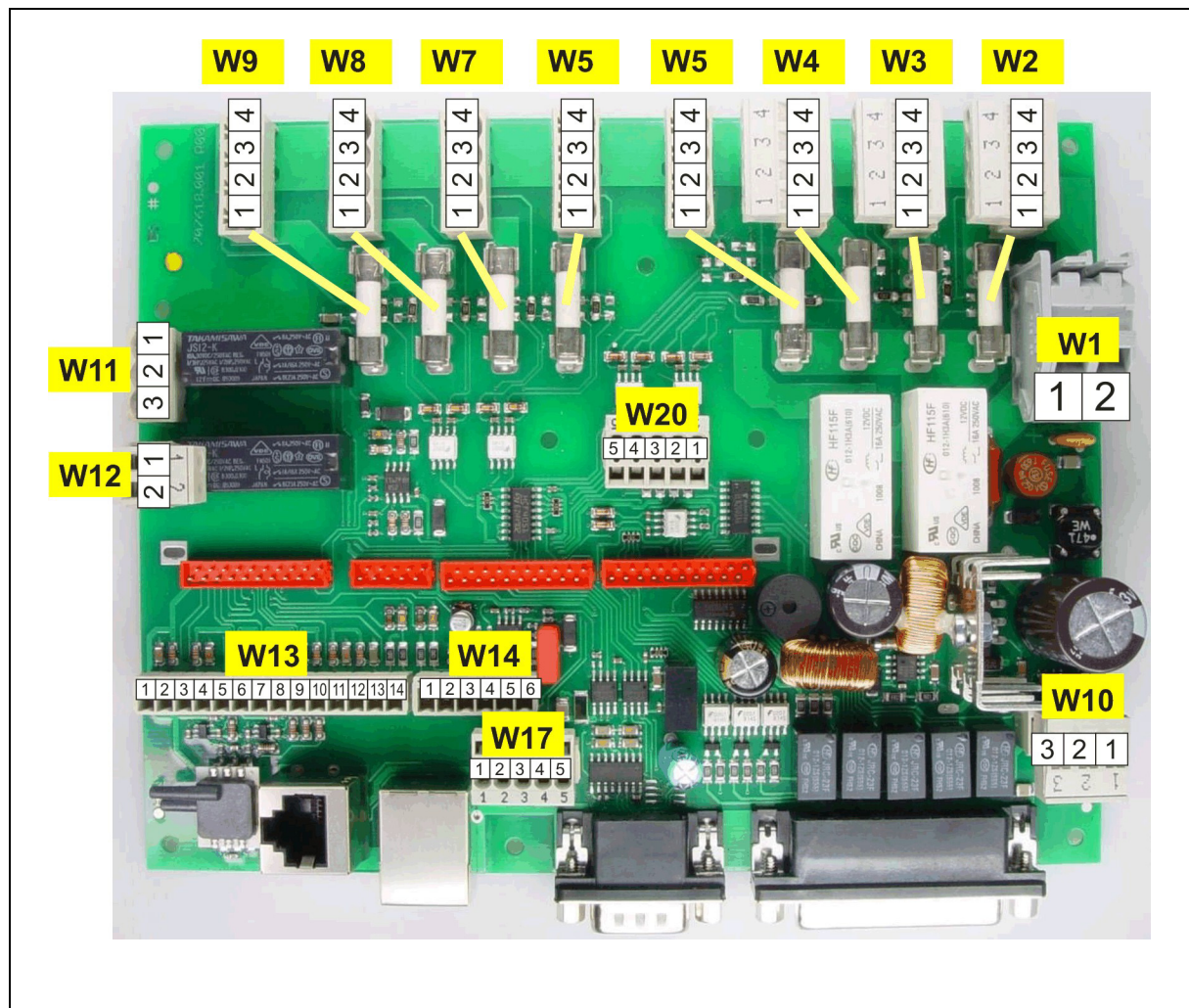
General Data		
Ambient temperature during transport (min./max.)	°C	-25 / 70
Ambient temperature outside cabinet during operation (min./max.)	°C	5 / 70
Relative humidity (min./max.)	%	5 / 95
Noise level, cabinet closed, fans at 80% fan speed	dB (A)	58
Noise level, cabinet closed, fans at 100% fan speed	dB (A)	61
Weight cooling module	kg	110
Weight cooling module with cabinet	kg	370
Technical data		
Cooling capacity	kW	max. 40
Cooling medium		water
Water flow volume	m³/h	max. 4.3
Pressure loss in device, measured at 3 m³/h	bar	0.6
Pressure loss in device, measured at 4.3 m³/h	bar	1.5
Water inlet temperature (min./max.)	°C	6 / 15
Airflow volume (max.)	m³/h	4000
Air exit temperature, adjustable (in steps of 0.1)	°C	18 to 30
Max. offset	K	2
Electrical data, AC version		
Supply voltage	1 / N PE	230 V / 50/60 Hz
Max. current draw	A	7
Max. power consumption (fan speed 100%)	W	1200
Power consumption normal operation (fan speed 80%)	W	835
Apparent power at full load	VA	1610
Pre-fusing (external)	A	D 10
Electrical data, DC version		
Supply voltage (line voltage)	VDC	48
Max. current draw	A	24
Max. power consumption	W	1152
Pre-fusing (external)	A	D 25
Water pipework (copper)		
Water inlet/return connection	Rp	1"
Condensate drain connection	Rp	½"

10 Appendix

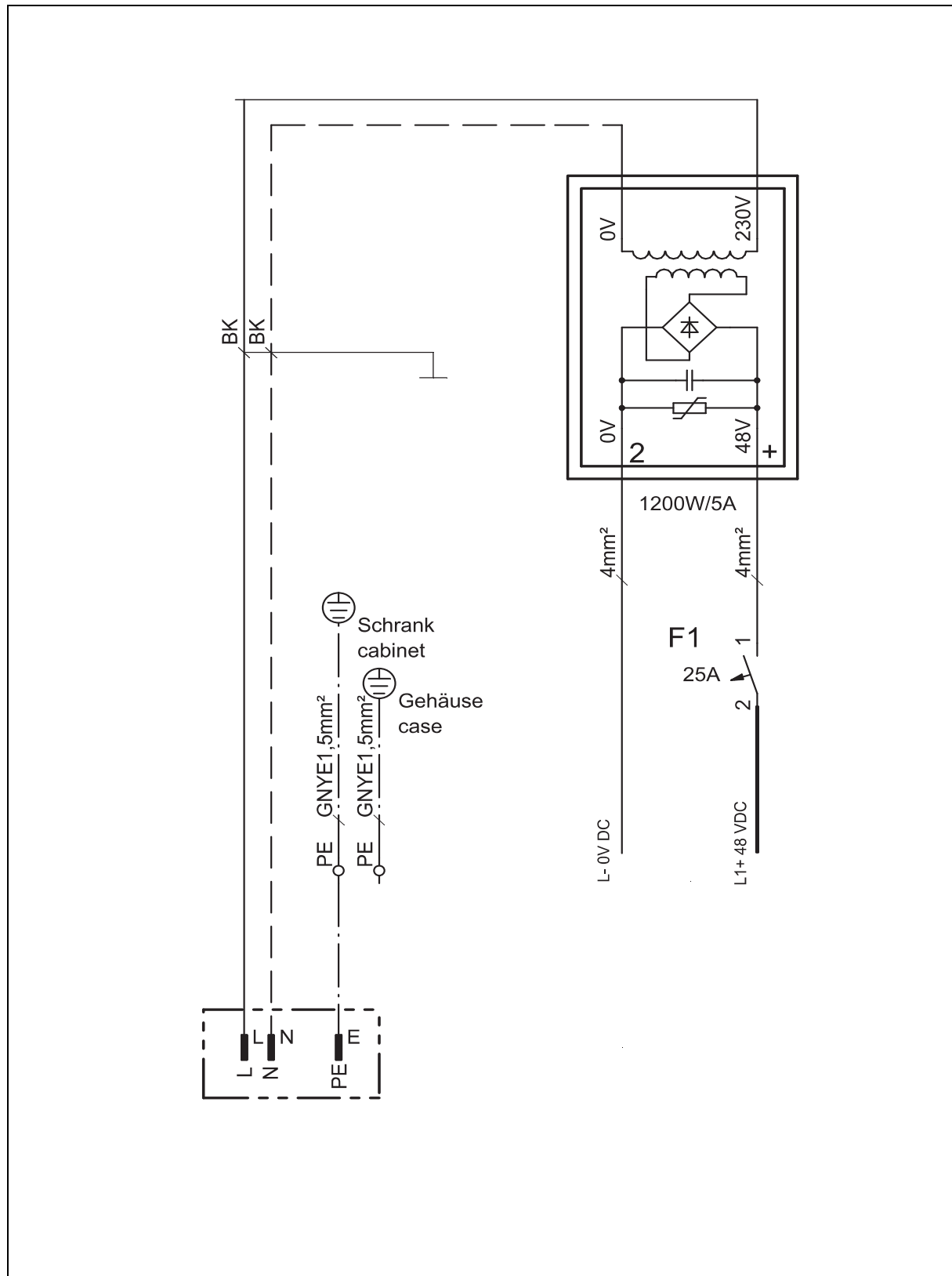
10.1 Cooling capacity



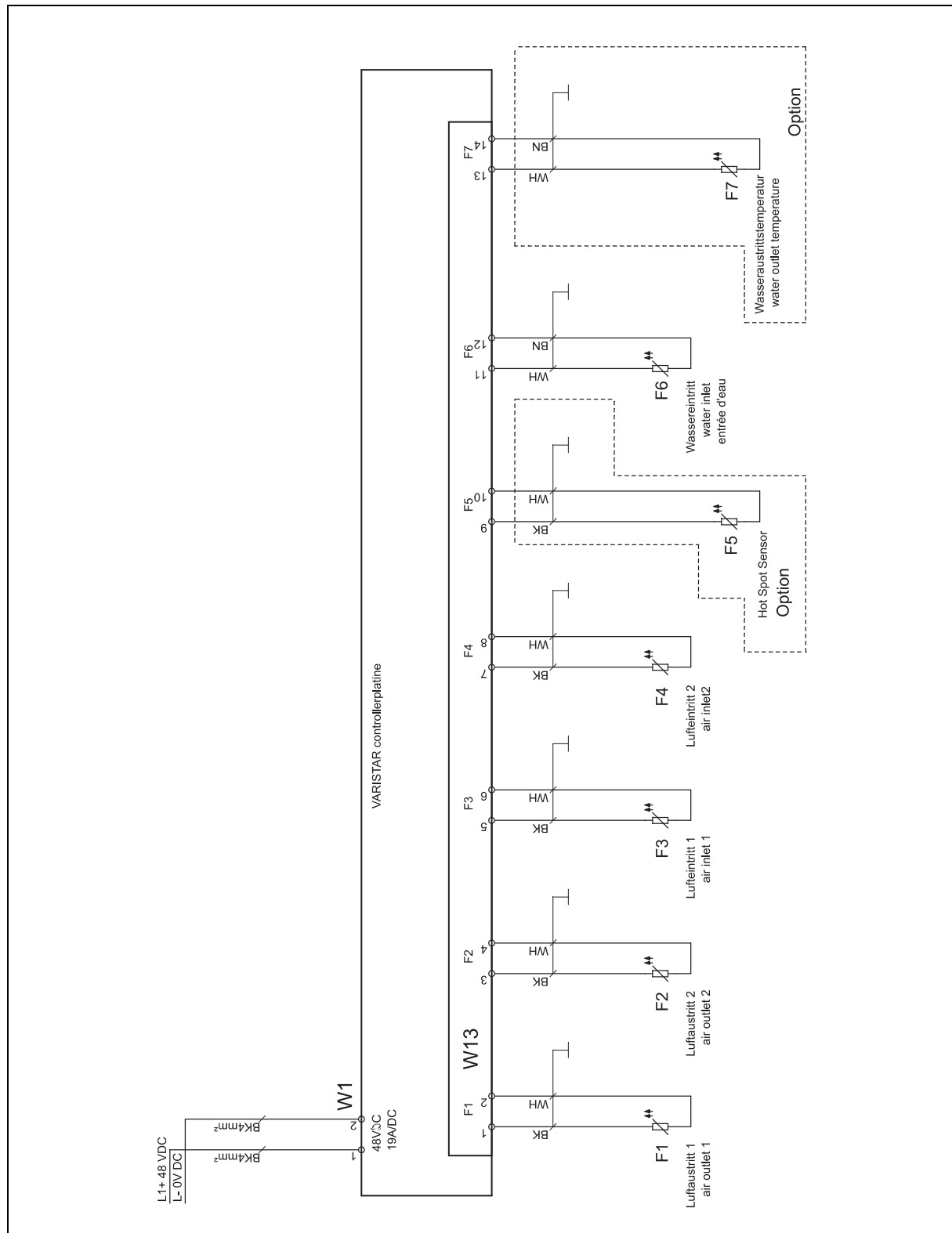
10.2 Connectors/interfaces on the control board



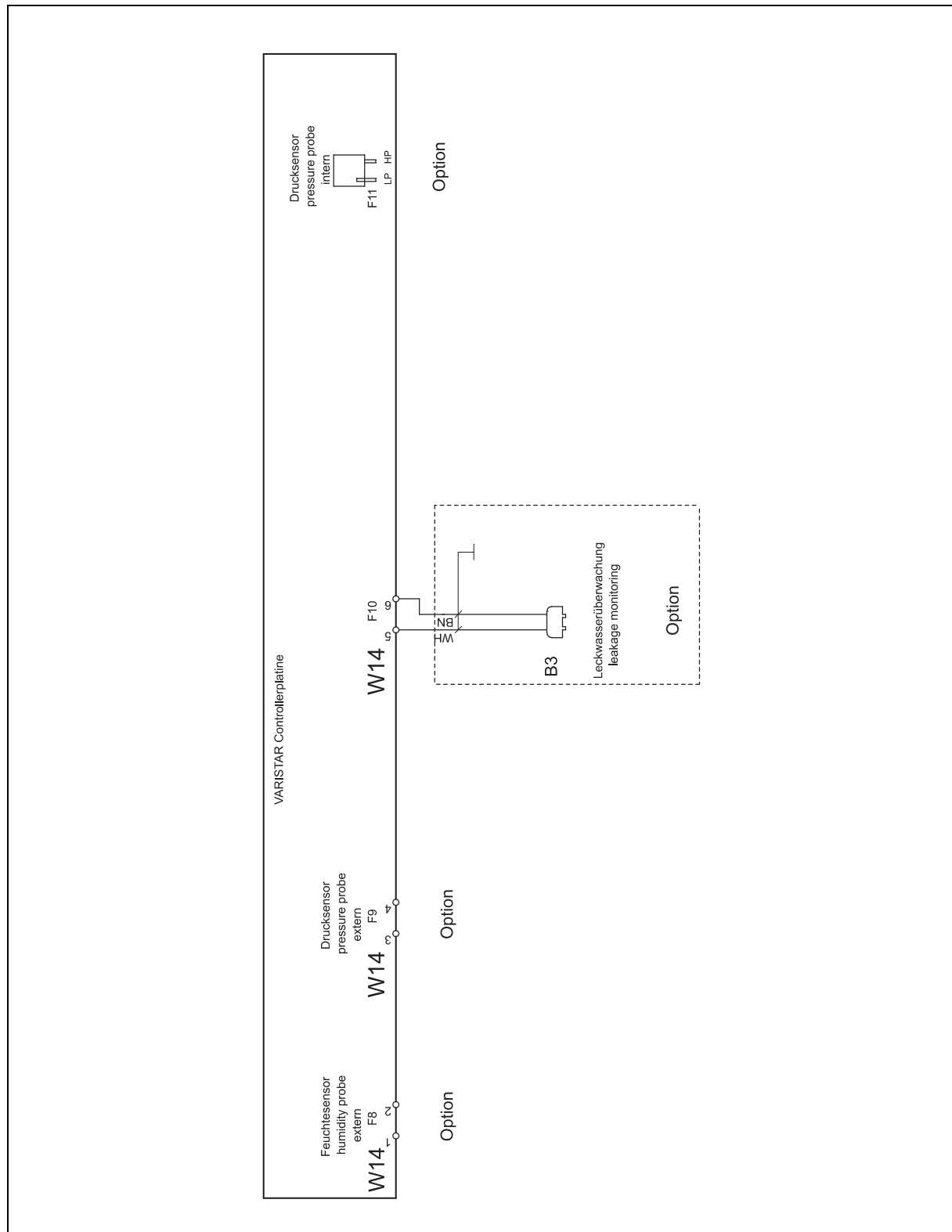
10.3 AC power supply diagram



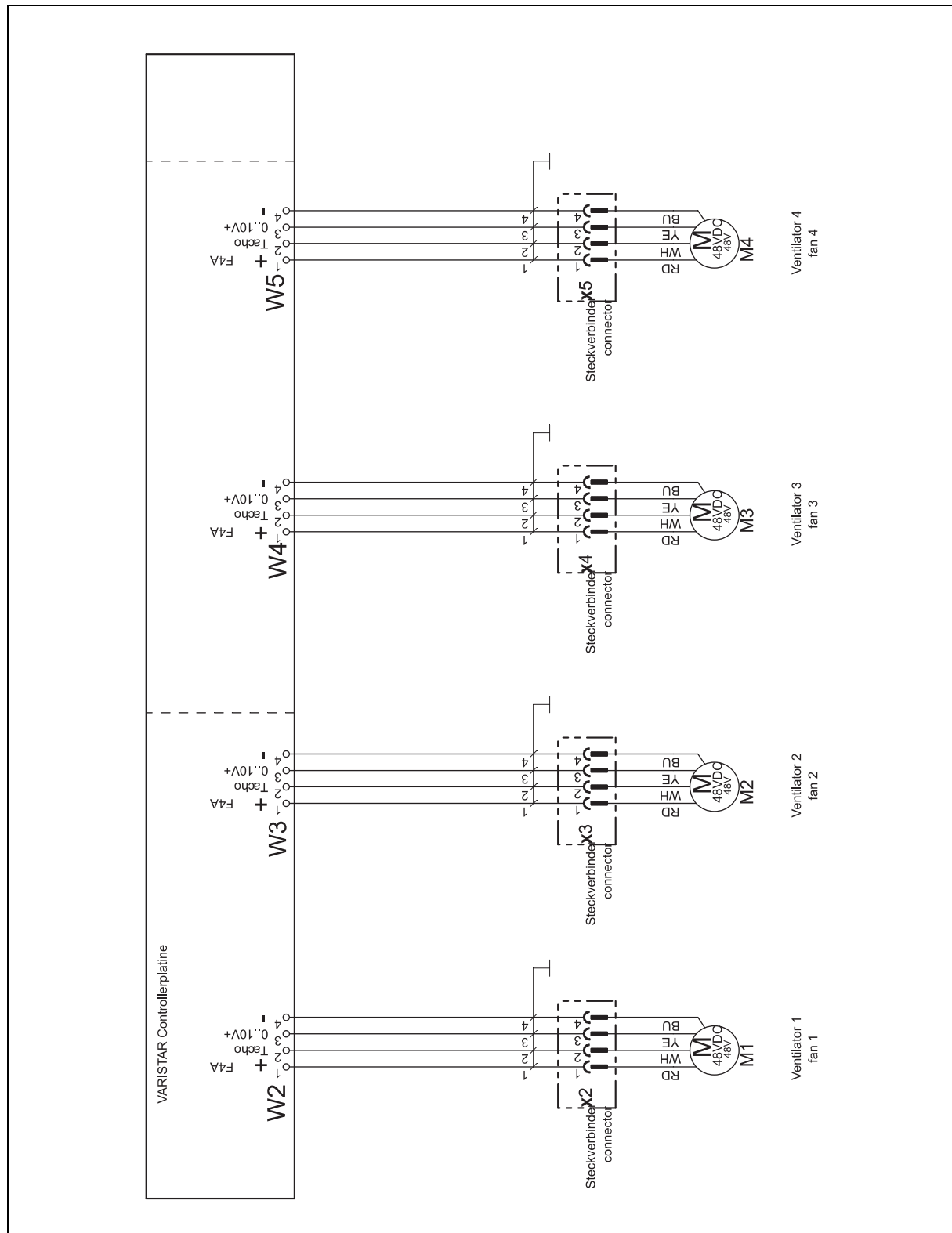
10.4 Temperature sensor connections



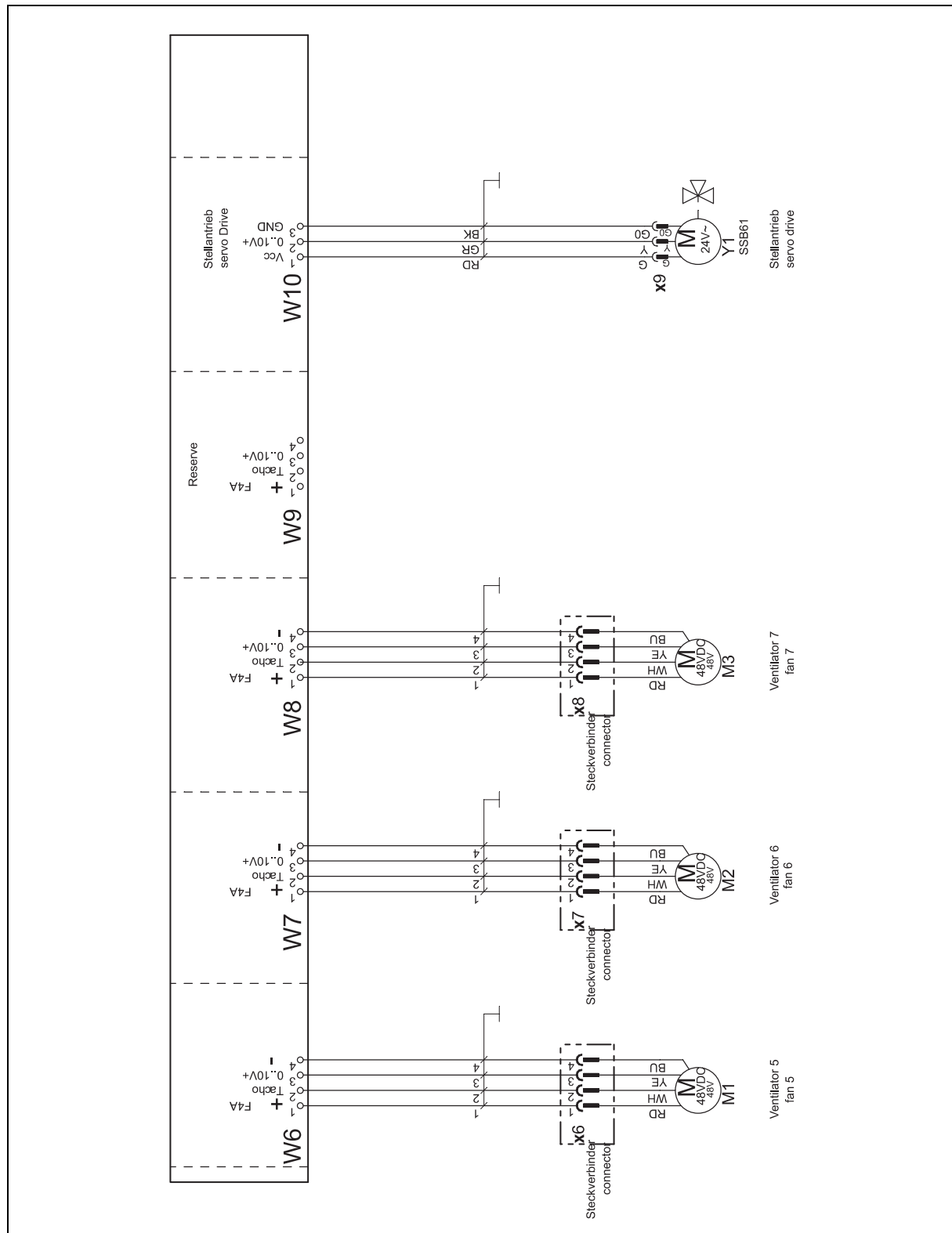
10.5 Sensor connections



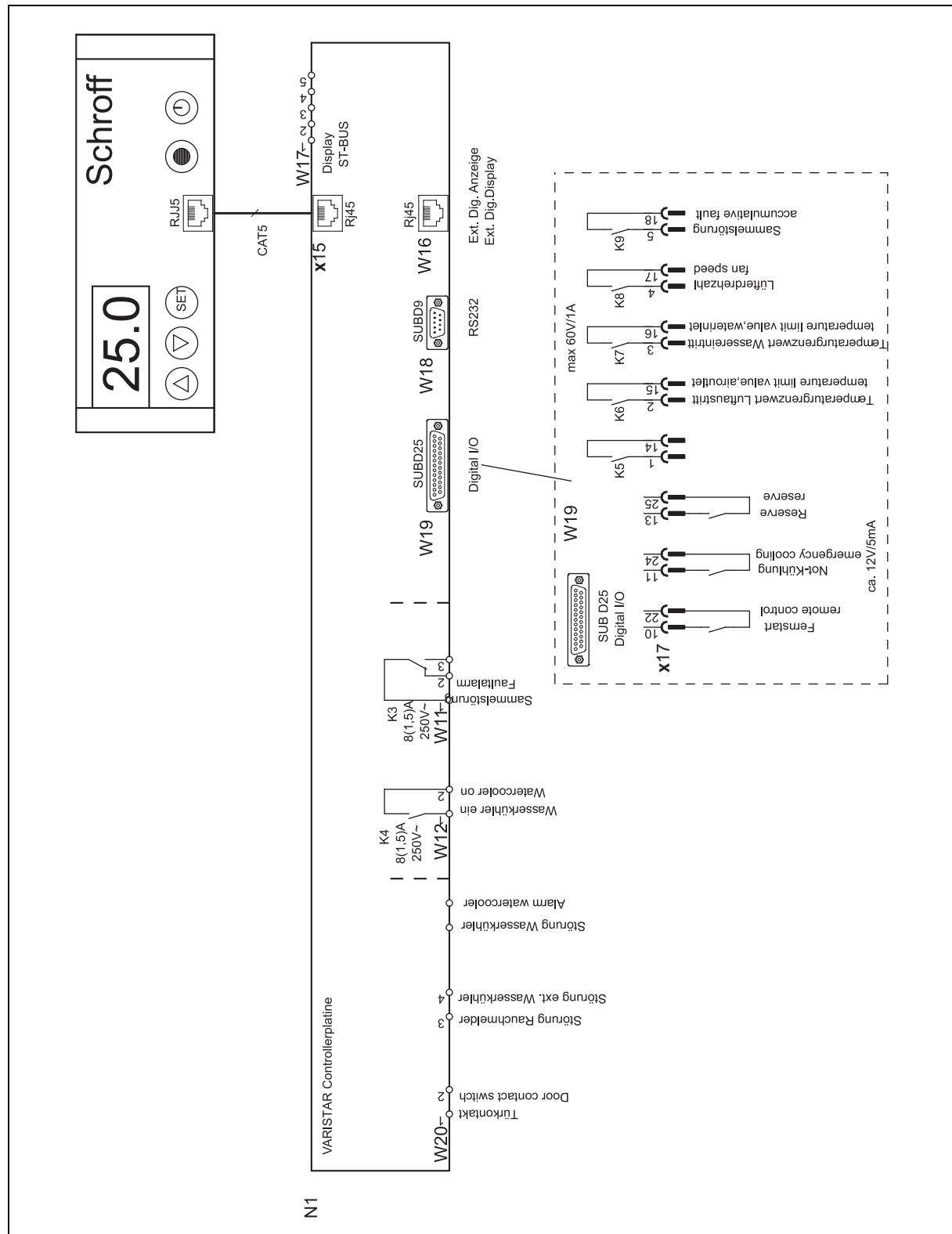
10.6 Fan connections



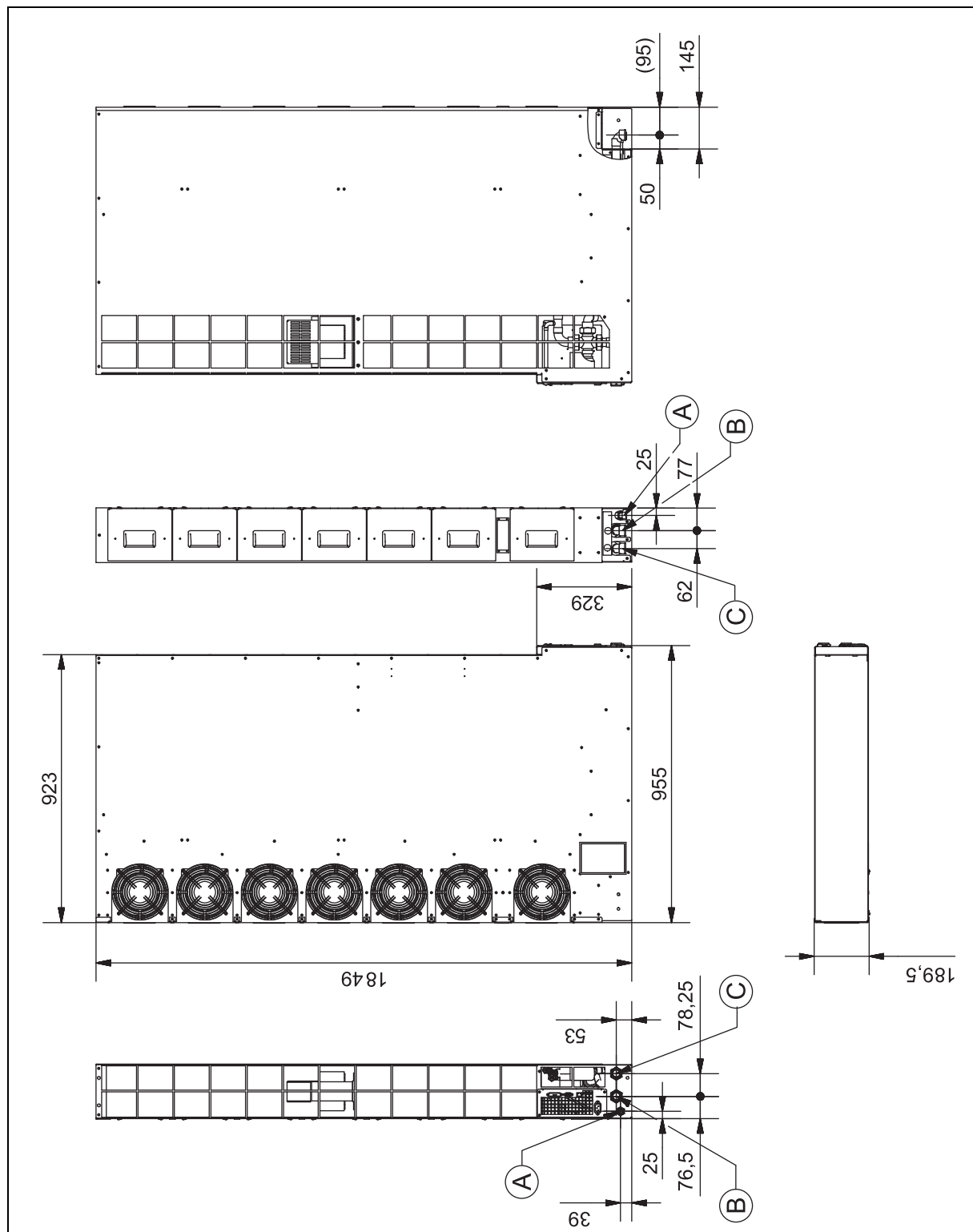
10.7 Fan and control valve connections



10.8 Display connection; connectors on the control board



10.9 Dimensions

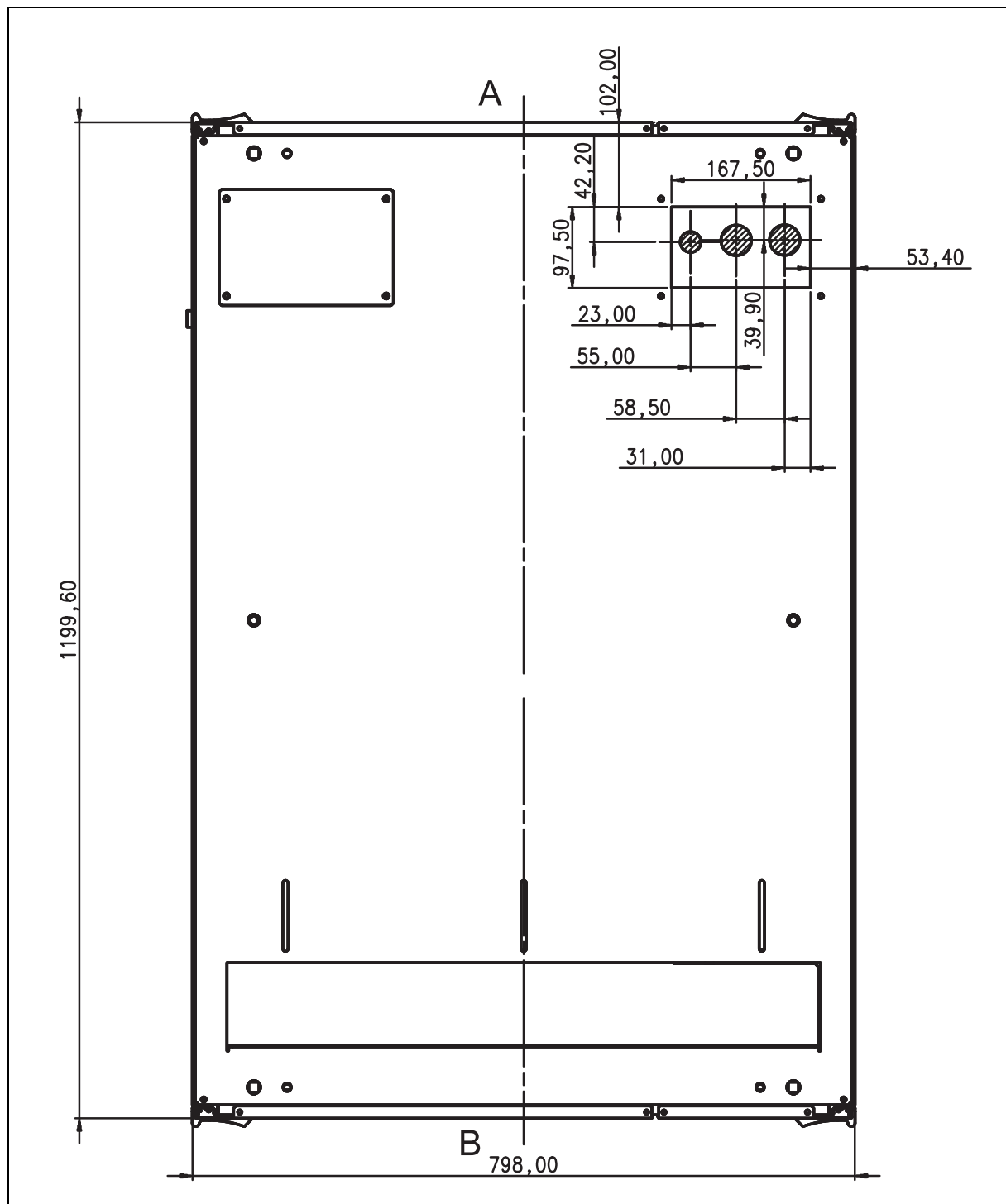


A: Condensate drain Rp 1/2"

B: Water flow Rp 1"

C: Water return Rp 1

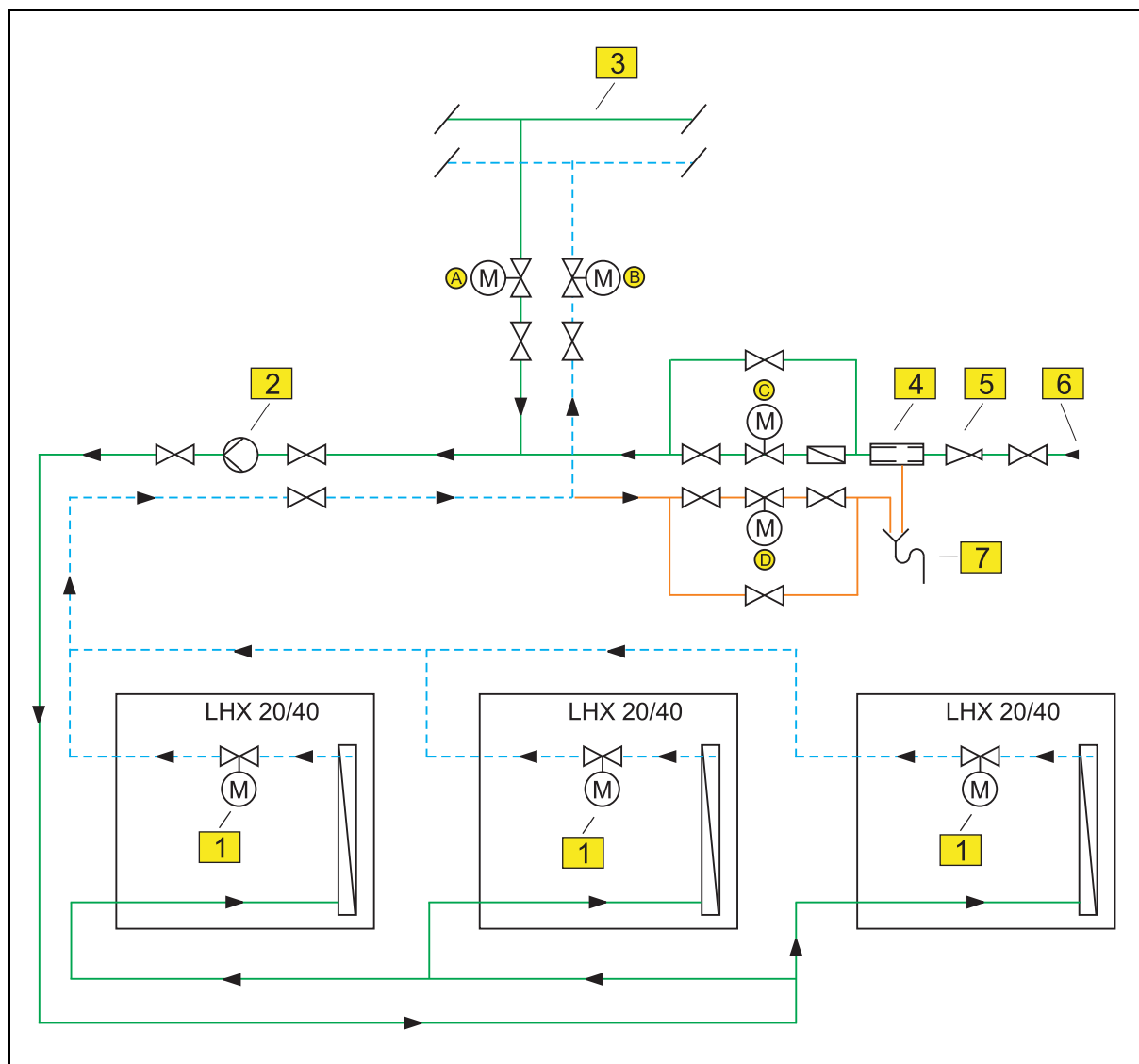
10.10 LHX 40 base plate



View of base plate from above

A = front; B = rear

10.11 Example installation



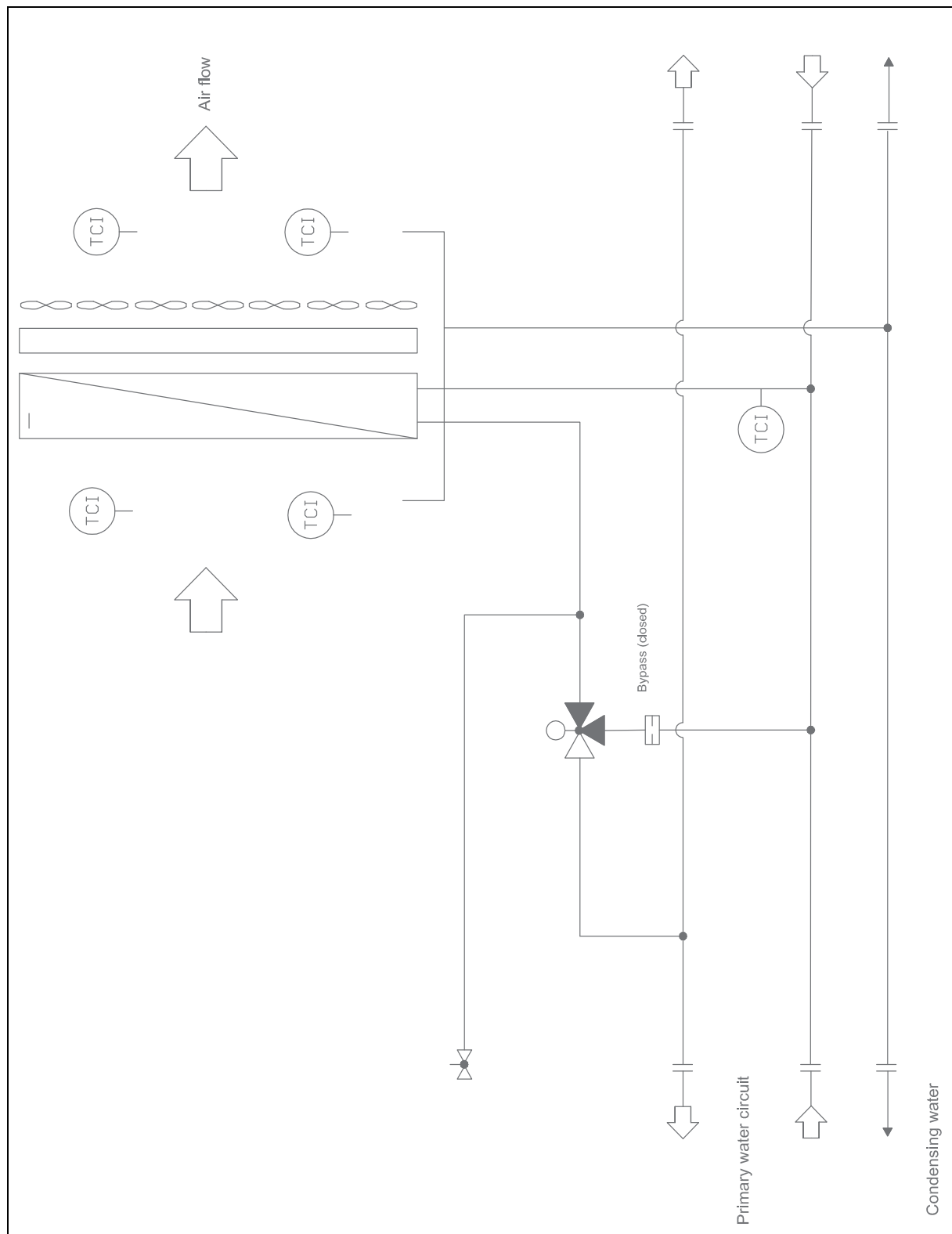
- | | | | |
|---|---|---|---|
| 1 | Control valve, volume flow 0-100% | 5 | Pressure regulator; adjust to system pressure |
| 2 | Circulation pump, differential pressure controlled. Discharge 0-100%, discharge head adjustable | 6 | Emergency mains water feed |
| 3 | Cooling water system supply | 7 | Mains water drain |
| 4 | Backflow preventer | | |

Emergency cooling:

Valves A and B closed, valves C and D open.

Valves A to D are motorised valves with end position switches.

10.12 Piping and instrumentation diagram



Bypass is sealed by default.

SCHROFF GMBH

www.schroff.biz

**Langenalberstr. 96-100
D-75334 Straubenhardt**

Tel.: + 49 (0) 7082 794-0

Fax: +49 (0) 7082 794-200